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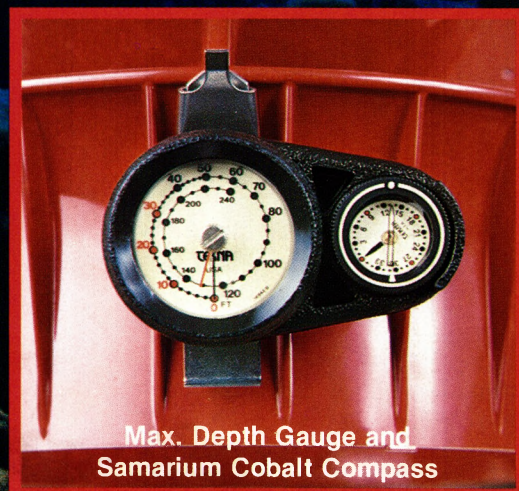
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COVER		<i>Surfside Statia co-owner/divemaster Mike Guderian examines a 17th century Dutch spirit bottle (left) and an 18th century porter bottle found on shipwrecks in Oranjestad Bay, St. Eustatius. For more on Statia, see page 72. Photo/Geri Murphy.</i>

Our new

We designed the Civic Wagon tall for its length and width. So there's more room inside. We sloped the hood for better aerodynamics and visibility. It makes for a very efficient machine.

Honda's newest power tool arrives ready to work. Its peppy 12-valve, 1488cc engine delivers the horsepower you need.



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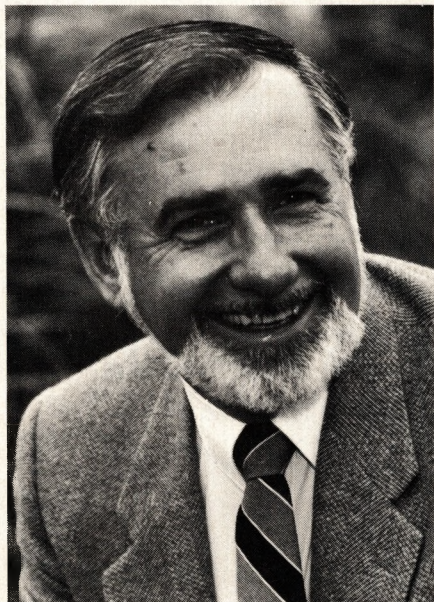
Front and rear stabilizer bars make it fun to drive. Even if you're just toolin' around.

HONDA

The Civic Wagon

SDM Editorial

BY THE PUBLISHER



REGULATOR Rx: TLC

A dive regulator is subjected to a wide variety of corrosive contaminants because of the harsh environment in which it must function. Salt air and saltwater moisture from ocean trips can collect inside and freeze working parts. Carbon dust, chlorinated water, ozone and hard-water mineral deposits can also do damage. The accumulation of these harmful deposits is usually not noticeable because the process is so slow, so gradual.

Even though you have stored it in a cool, dry place, those deadly corrosive contaminants have had their chance to form hard, crusty deposits in the regulator and do more harm than actual use in open water. Much of this damage goes unnoticed because it is happening inside, hidden from the eyes of the owner.

Several leading regulator repair technicians have revealed seven deadly sins that affect regulator performance:

1) Hard Breathing is most commonly caused by saltwater corrosion. Internal moving parts become encrusted with salt crystals and a scale, which causes them to stick or operate sluggishly. Inhalation resistance is often tripled or quadrupled, thus making it extremely difficult or impossible to obtain sufficient airflow at depth during heavy breathing.

2) Rust Clogging the sintered filter of the first stage can be caused by the rust or corrosion dust that accumulates inside a scuba tank. Fine rust particles clog the pores of the filter screen and often coat the internal moving parts, causing sluggish or sticky operation.

3) Carbon Dust Clogging sometimes results from ultra-fine carbon dust, the by-product of a poorly-operating air compressor. The carbon dust comes from the charcoal filter on the air compressor. This condition may go unnoticed for quite some time because the buildup is so slow and the dust almost invisible.

4) Water Leakage in the regulator mouthpiece is commonly caused by the deterioration of the second stage exhalation valve. The super-thin rubber disc becomes gummed-up from the effects of chlorinated pool water, ozone in the atmosphere or normal aging. Stickiness of operation can cause increased exhalation resistance, intermittent water leakage and, finally, complete flooding of the second stage.

5) Freeflowing can be caused by dirt or dust particles that mar or dent the high pressure valve seat in the first stage. The smallest speck of dirt or rust on this finely-machined surface can cause a steady seepage of high pressure air into the low pressure hose and second stage. The damage is irreversible and the leak tends to get worse with additional use, until air is flowing out of the regulator mouthpiece in an uncontrolled stream.

6) O-ring Leaks can result from the buildup of salt corrosion inside the regulator or from a general drying out of the silicone lubricant needed to keep these seals healthy. The slightest crack, tear, nick or split on the surface of an O-ring will break the seal and cause either an intermittent or steady leak of air. Continued use of a faulty O-ring can result in a complete break of that seal and the rapid flow of large amounts of air.

7) Erratic Flow of air can be caused by a second stage that is not properly tuned or has parts that are sticking. The intermediate stage pressure may be wrong or the second stage lever improperly set or perhaps the breathing diaphragm is brittle. Internal parts and settings go out of whack as a result of aging, hard use or saltwater exposure.

No amount of washing or careful use can completely prevent your regulator from getting out of tune. Routine maintenance

can prolong its good performance, but eventually your regulator will need service and tuning. The job should be done every six months or once a year, depending on the amount of usage and the kind of exposure your particular unit receives. Generally speaking, a good internal cleaning (ultrasonic or acid dip) by an experienced regulator repair technician will take care of 90 percent of the performance problems. Parts replacement is generally minimal, amounting to a few O-rings and perhaps a valve seat and more flexible breathing diaphragm.

Considering the vital importance of good regulator function, the cost of cleaning and tuning is surprisingly reasonable, usually under \$50, most of which is for technician labor. When you divide this repair charge by the number of months of trouble-free performance you receive, it amounts to a small maintenance charge of three to four dollars per month. It is a small price to pay for the care of a life support device.

Where should you take your regulator for repair? You have several options. The most obvious is your local professional dive store where you may have originally purchased your regulator or where you regularly obtain air fills. Many pro dive stores maintain a well stocked service center for the equipment they sell and their technicians are sent to dealer repair workshops conducted by the factory. Another option is to send your regulator to one of the large regulator service centers that specializes in the repair of regulators, hydrostatic testing of tanks and servicing of other scuba accessories. Your regulator can be mailed in, serviced and returned in less than two weeks. Still a third option is to send your regulator back to the factory where it can be overhauled by personnel who generally have every conceivable replacement part at their disposal.

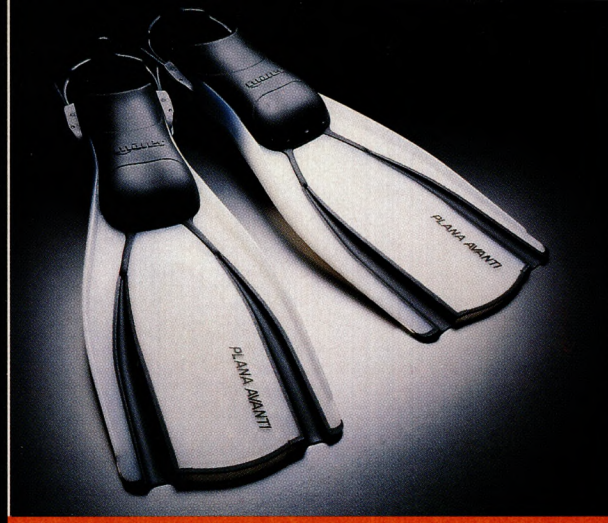
The most important thing to remember about getting your regulator repaired, cleaned or tuned is that it should be done *early* in the season. Don't go in the water if your breathing machine isn't performing perfectly. ➤

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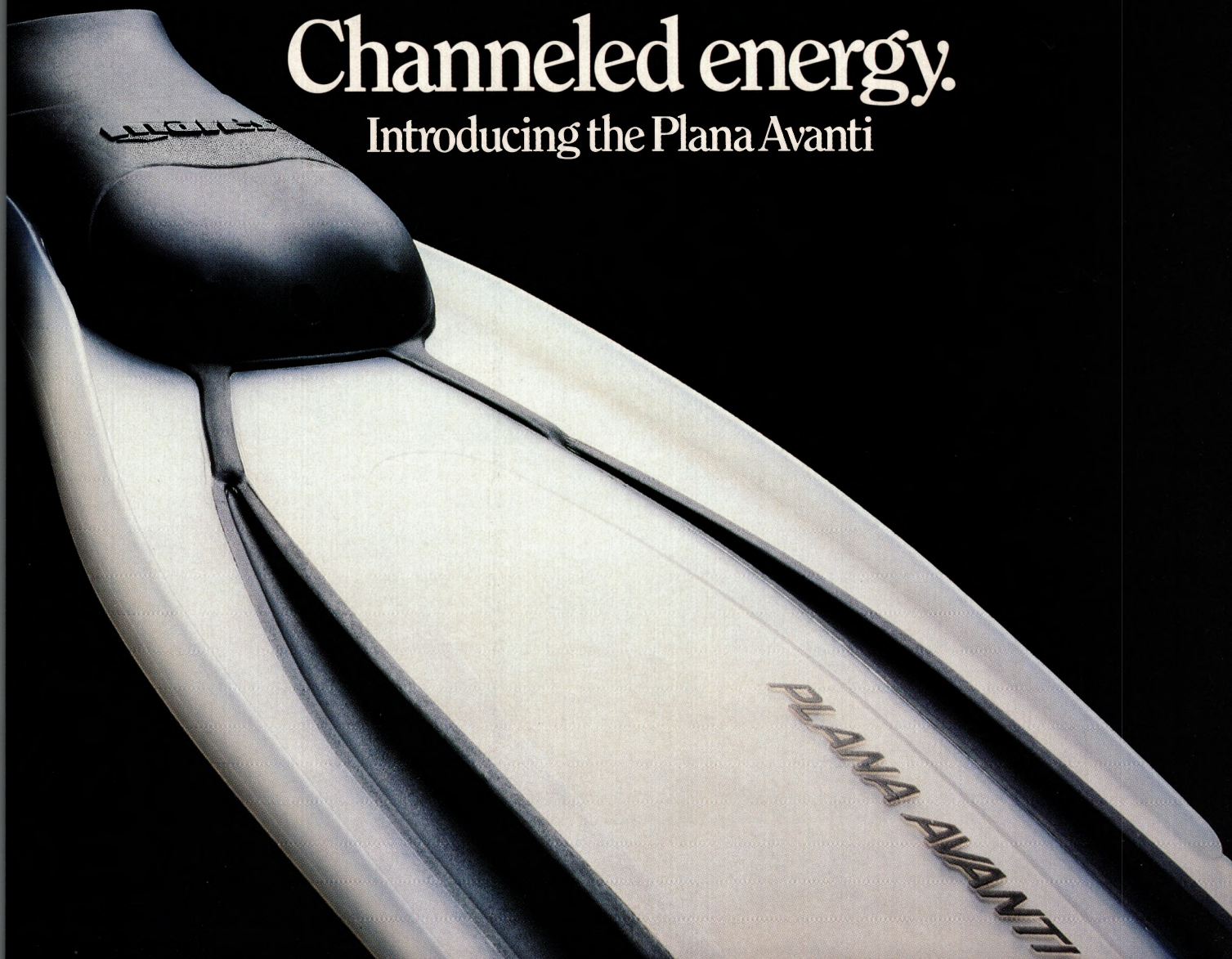
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 **U.S. DIVERS®**

Scuba Quiz

Category: Emergency Communications

By Dennis Graver

Divers frequent remote locations and should know how to obtain assistance in the event of an emergency. Help can be summoned in many ways. Are you familiar with them? Here's an opportunity for you to find out how well you can communicate. Select the most correct answer for each question, then compare your answers with those on the following page.

1. If you can telephone for help for a diving accident, your first choice should be the 911 emergency number.

- ☐ A. True
- ☐ B. False

2. Which of the following is the telephone number of the Divers Alert Network?

- ☐ A. (919) 684-8111
- ☐ B. (919) 681-6841
- ☐ C. (919) 583-7171
- ☐ D. None of the above

3. The emergency channel for VHF is:

- ☐ A. Channel 12
- ☐ B. Channel 16
- ☐ C. Channel 22
- ☐ D. None of the above

4. Other emergency radio frequencies are:

- ☐ A. 2182 khz and 156.8 mhz
- ☐ B. 121.5 mhz and 243.0 mhz
- ☐ C. 1218 khz and 218.2 mhz
- ☐ D. A and B, but not C

5. Arrange in sequence the following procedures for an emergency radio transmission:

- ☐ A. State "Mayday" and identify your craft

- ☐ B. State "Mayday" and your identity three times
- ☐ C. Transmit alarm signal for 30-60 seconds
- ☐ D. State nature of distress
- ☐ E. State your location

6. Which of the following flag signals is *not* officially recognized as an international distress signal:

- ☐ A. National flag flown upside down
- ☐ B. An orange flag with a black square and ball
- ☐ C. Code flags NC
- ☐ D. A square flag flown above or below a ball

7. Which of the following statements regarding use of flares for emergency signaling is *incorrect*:

- ☐ A. Three red flares are recommended
- ☐ B. The flares may be hand-held, parachute or meteor type
- ☐ C. Flares aboard boats must carry certification numbers
- ☐ D. Flare guns are not classified as handguns
- ☐ E. All of the statements are correct

8. Which of the following is *not* included in the official international distress signals:

- ☐ A. Flames aboard a vessel
- ☐ B. Orange smoke
- ☐ C. Repeatedly raising and lowering outstretched arms
- ☐ D. A dye marker in the water
- ☐ E. Continuous sounding of a fog horn

9. Transmissions from Emergency Position Indicating Radio Beacons (EPIRBs) are monitored by:

- ☐ A. All aircraft flying over water
- ☐ B. U.S. and Soviet satellites

- ☐ C. U.S. military
- ☐ D. VHF receivers
- ☐ E. Any of the above depending on the type of EPIRB

10. The international SOS distress signal consists of transmissions (light, sound, etc.) of:

- ☐ A. Three shorts, three longs, three shorts
- ☐ B. Three longs, three shorts, three longs
- ☐ C. Four shorts, three longs, four shorts
- ☐ D. None of the above

11. The emergency signal when using a whistle is:

- ☐ A. SOS blasts
- ☐ B. Repetitions of four or five short blasts
- ☐ C. Continuous sounding
- ☐ D. None of the above

12. Which of the following signaling equipment is least desirable for a diver in the water:

- ☐ A. Whistle and mirror
- ☐ B. Flares
- ☐ C. Smoke bomb and dye marker
- ☐ D. Flashing strobe light

13. Select the *incorrect* statement.

- ☐ A. Some areas have diving emergency phone numbers where all emergency arrangements can be made with one call
- ☐ B. Information on the nearest operational recompression chamber can be obtained by calling the Experimental Diving Unit (EDU) in Washington, D.C.
- ☐ C. The U.S. Coast Guard can be contacted for emergency transportation of diving victims
- ☐ D. All of the above are incorrect

Scuba Quiz

Answers: Emergency Communications

1. B. True. Emergency medical personnel should evaluate a dive accident victim first—they are trained to initiate treatment based on the victim's condition. These people should contact DAN for dive medical or chamber information if necessary.

2. A. (919) 684-8111. The Divers Alert Network (DAN) provides information for early medical care and the nearest support personnel and facilities. When you call DAN in an emergency, you will receive emergency medical advice and this service is available 24 hours a day. All divers should support DAN by being a member of the network.

3. B. Channel 16. This is the primary VHF channel and is designated for use in distress. Channel 16 is *not* to be used for non-emergency transmissions except initial contact between vessels. It should be monitored when the radio is not being used for other purposes. Channel 6 is another channel with restricted use. It is designated for inter-ship safety communications only.

4. D. A and B, but not C. 2182 khz is the emergency frequency for single sideband radios, which allow communications beyond VHF range. 156.8 mhz is the operating frequency of Channel 16 of a VHF radio. Some radios may be tuned to specific frequencies rather than just channels. Be sure you are familiar with the radio aboard a vessel and can use it for emergencies. The 121.5 and 243.0 mhz frequencies will be addressed in another answer.

5. C, B, A, D, E. Some radios are equipped with a radio telephone alarm signal button. This signal should be

sent first because it attracts the attention of people on watch and, at some stations, even activates automatic alarm devices. Sample verbal emergency transmission: "Mayday, Mayday, Mayday. This is yacht *Fundiver*, yacht *Fundiver*, WXY 1234. Mayday, yacht *Fundiver*, WXY 1234. (Nature of distress, exact location)."

6. A. National flag flown upside down. All of the other flags listed in the possible answers are officially recognized as distress signals. The upside down national flag is recognized unofficially, however, and could be used if no other means of signaling were available.

7. D. Flare guns are not classified as handguns. The laws of some states classify flare guns as weapons. Check local handgun regulations. Both day and night requirements for flares can be met by having three red flares aboard your boat. The flares may be hand-held, parachute, or meteor type.

8. D. A dye marker in the water. Dye markers are not easily seen and their duration is not very great. A dye marker is not without merit, however, because it is a widely recognized distress signal, even though unofficial. Flames, such as a fire of oily rags in a bucket, gain attention quickly on the water; but there is danger associated with a fire signal.

9. E. Any of the above depending on the type of EPIRB. There are three types of EPIRBs: Class A and B for use more than 20 miles offshore,

and Class C for use under 40 miles. Some are water activated and some must be switched on manually. Some transmit a signal on 121.5 mhz, the aeronautical emergency frequency. Others transmit on 243.0 mhz, a military search and rescue frequency. Type C transmits on Channel 16 of VHF.

10. A. Three shorts, three longs, three shorts. Everyone should know Morse code for the letters SOS. This distress signal can be transmitted both audibly and visually in a variety of ways.

11. B. Repetitions of four or five short blasts. Whistles—the police whistle type—are very good for use on the water. The sound carries very well over the water and little energy is required to produce a lot of noise. Practice the emergency signal when there is no one around so you can develop the ability to add a sense of urgency to your blasts.

12. C. Smoke bomb and dye marker. The drawbacks of dye markers have already been mentioned and smoke flares can be dangerous. I know a diver who had one attached to his knife sheath, which was strapped to his leg. The flare went off and the diver invented a new dance!

13. B. Information on the nearest operational recompression chamber can be obtained by calling the EDU in Washington, D.C. The EDU used to provide this service, but has discontinued it.

Did you know all of the distress signals? If not, are you now more familiar with them? Be sure when you go diving that you have all required signaling equipment and that it is in good working order. The equipment should be stored in a dry place and inspected at least once a year. I hope you never are a participant in a diving emergency situation, but if you are, I hope you will be able to expedite assistance by being able to send signals correctly.

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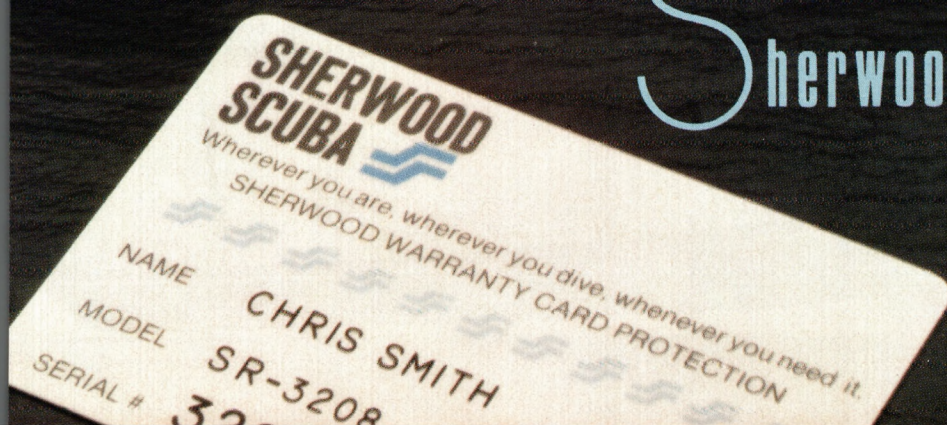
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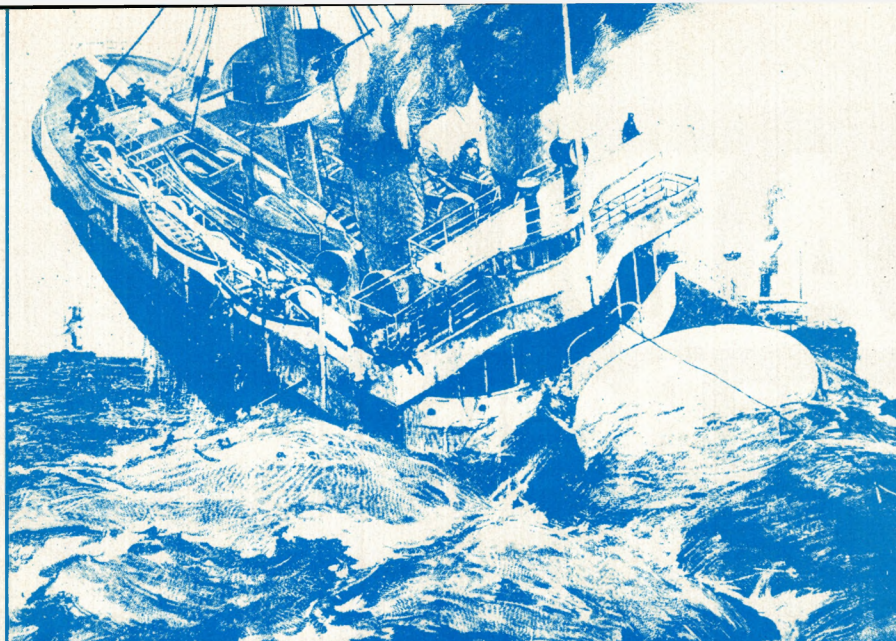
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Wreck Facts

BY ELLSWORTH BOYD

Will Pat Labadie, Duluth, Minnesota, please take a bow? He may take one figuratively since he almost took one literally—the bow of the elusive *Algoma*. The disaster was in 1885 and the weather was horrendous—a blinding snowstorm sweeping across Lake Superior. The steel passenger ship *Algoma* broke in two when she ran aground on a tiny islet near Isle Royale in the frigid northwest region of the lake.

Forty-six passengers and crew lost their lives and the stern was washed ashore by violent wind and waves. But the location of the bow has remained a mystery for 100 years, despite numerous attempts to find it by sport divers.

Everybody thought the bow was in deep water, but Labadie figured it might be somewhere in a series of ridges, crevasses and valleys west of where the stern washed ashore. Searching in 50 feet, he found evidence of the bow but not the bow itself. "A lot of divers have put in a good deal of effort in attempts to find it," Labadie says, "and I think they're on the right track. I suspect it will be found this diving season." Labadie, director of the Canal Park Museum in Duluth, is presently researching the *Kamloops*, *Congdon* and *Monarch*.

Peter Hess, Dover, Delaware reports that divers from the Atlantic Alliance for Maritime Heritage Conservation have discovered the remains of two ships sunk more than 200 years ago in the Mullica River near Atlantic City, New Jersey. The vessels are believed to be American privateers scuttled by the British during the Revolutionary War.

Marine archaeologists Dan Koskikarell, Jim Sinclair and Duncan Mathew-

son led a dive team into waters with nearly zero visibility. Despite strong currents, they retrieved pieces of pottery, the ship's rigging, deadeyes, a bone china plate and an eight foot long anchor with its wooden stock intact. Eight other ships might have been scuttled by the British in this same area in 1778. Working cooperatively with a New Jersey museum, Atlantic Alliance marine archaeologists and sport divers will continue to search the 20 foot deep waters near the banks of the Mullica. Their goal is to uncover more relics from the days of privateering and research roles played by these ships in America's quest for freedom.

Some readers might remember Mike Weiner, whom I wrote about several years ago. Mike was a commercial fisherman in Florida with a penchant for shipwrecks. Disappointed with the lack of available nautical charts depicting wreck sites, Mike decided to research wrecks and publish his own charts, including latitude, longitude and Loran-C. Mike's

Wreck Charts business was launched and he sold them from his home and through dive shops and nautical chart dealers. But the new age of computers fascinated Mike and he moved to New York to work as a salesman for Xerox Corporation. Here he invented a paper cassette for Xerox copiers, wrote a computer program to motivate sales and developed a software program to help him with his nautical charts and maps.

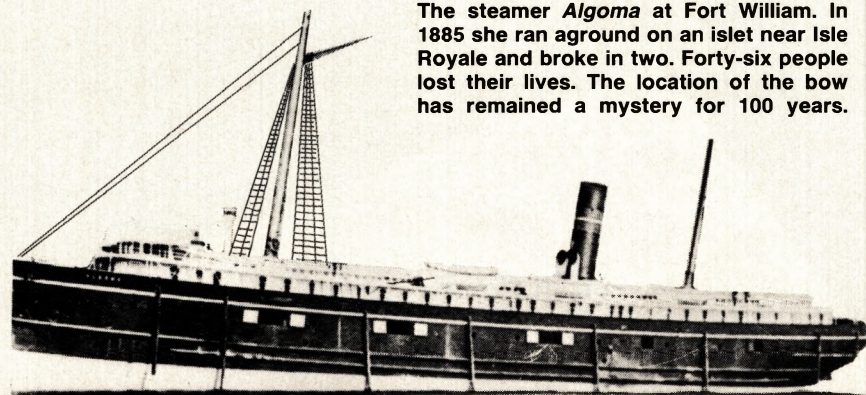
Mike left Xerox to launch his own company, Writing Consultants, Rochester, New York, where he has invented Word Finder electronic thesaurus software and publishes other software programs innovative to the computer world. According to Money Magazine, Mike's company grossed in the six figure profit category last year, making him a bright new entrepreneur in the corporate world. It's an interesting coincidence that using a personal computer for Wreck Charts research got Mike into a lucrative software business. Mike still dabbles in Wreck Charts and can be reached at: 11 Creek Bend Dr., Fairport, NY 14450.

Thanks to Don Thompson, Tampa, Florida and J. Treavor, Alvin, Texas for telling me about Richard Ray's Phantom Isle Lodge, Costa Rica, Central America. Both Thompson and Treavor visited the lodge and had good luck bringing up artifacts from old shipwrecks. Thompson writes: "The trip starts from the capital city of San Jose. You go up and over a spectacular 11,000 foot mountain, then down a classical jungle river by native dugout canoe to the lodge, which is built on a hill overlooking the Pacific. There are no crowds or vendors, only miles of deserted beach and great wreck diving. Also, you can pan for gold in a nearby stream, explore pre-Columbian ruins or hike miles of jungle nature trails." For more details write: Richard Ray, P.O. Box 558, Manvel, TX 77578; phone (713) 489-9156.

Explorer Lee Spence, Shipwrecks, Inc., has discovered the remains of two wrecks off the coast of Georgia, both of them more than 100 years old. Testing a new sidescan sonar unit, Spence first found the *Carrier Dove*, a square-rigged sailing vessel lost in 1876 on her way

(Continued on Page 40)

The steamer *Algoma* at Fort William. In 1885 she ran aground on an islet near Isle Royale and broke in two. Forty-six people lost their lives. The location of the bow has remained a mystery for 100 years.



photo/Canal Park Museum

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Photos by LARRY CUSHMAN

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Diving Medicine

BY ALFRED A. BOVE, M.D., Ph.D.

Recently, we reviewed letters you sent inquiring about diving medical problems. The data were presented at the annual meeting of the Undersea Medical Society held in June 1985. A striking trend toward ear related problems was evident. In fact, ears outranked all other problems but one—general medical problems—in importance. The ear, therefore, is the most common single problem we have in diving. In this month's column I will review ears and diving.

Problems with the ear can be considered from the outside in. Figure 1 shows a schematic diagram of the ear with the external canal, the eardrum (tympanic membrane), the middle ear, eustachian tube and the round and oval windows. The bones of the middle ear, which transmit vibrations from the eardrum to the round window, are labelled M, I and S.

Starting from the outside, we encounter the external ear itself. This structure has characteristics that identify us as individuals and contribute to our physiognomy. The external ear is occasionally injured from trauma and can rarely become infected, but in general, it will not be a problem in diving.

EXTERNAL EAR CANAL

Next on the pathway inward is the external canal. This is a bony canal in the skull that is lined by skin. The lining cells secrete ear wax and protect themselves from infection by a coating of wax and oil. Normally ear wax is pushed slowly outward so that it does not accumulate and block the external canal. The external canal can become blocked by several processes: ear wax, exostoses, external otitis or a foreign body.

Vigilance about ear wax will prevent blockage. I am always surprised to find an external canal blocked by ear wax. Good ear care will prevent wax buildup. A completely blocked external canal can produce a reverse squeeze if pressure cannot be transmitted to the eardrum through the wax plug.

Exostoses are bony protuberances that grow from the walls of the external canal. They can become large enough to block the canal and increase the risk of reverse squeeze. These bony growths are often found in swimmers who are exposed to cold water. The exostoses seem to be stimulated to grow from the cold water

exposure. They are quite evident on examination of the middle ear and can be removed by an ear specialist if they become severe.

External otitis, also called "swimmers ear," results from an infection of the external canal. The infection usually occurs because water is allowed to remain in the

an oily coating to the external canal.

Foreign bodies in the external ear canal vary from peanuts to mosquitoes. Anything that remains in the external canal for a long period (a few days) will produce injury to the lining surface of the canal and begin an infection. If a foreign body finds its way into your ear, have it

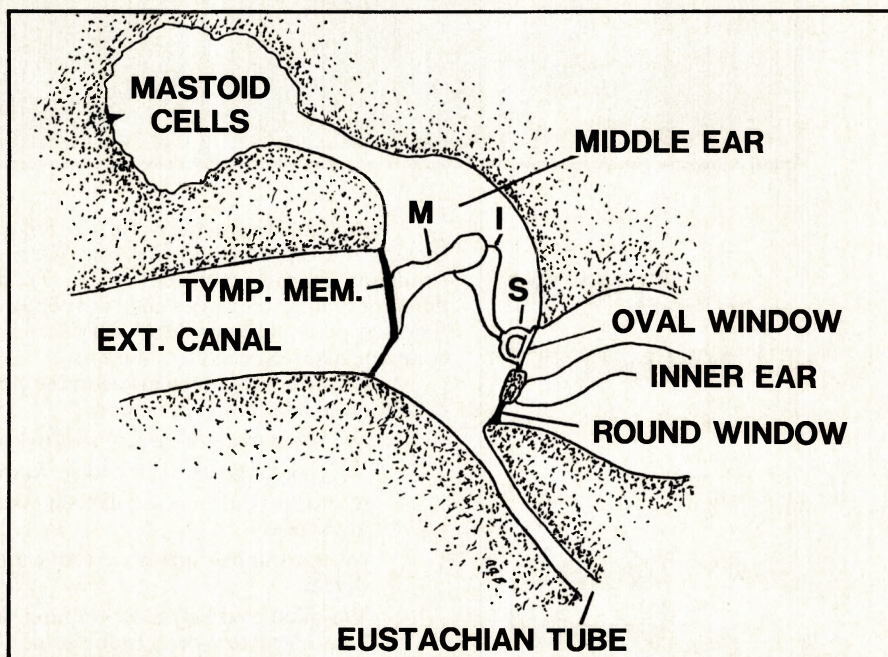


Figure 1: The human ear is divided into three chambers by membranes (i.e. the eardrum and round window). Pressure must remain relatively equal in all three or injury occurs.

external canal for prolonged periods of time. The water is usually dirty and fosters the growth of bacteria and fungi that can produce severe infections that will keep you from diving for several weeks. In some people who have lowered resistance to infection, these external ear canal infections can be fatal. External otitis usually produces continuous ear pain, decreased hearing and a discharge from the ear. It is readily diagnosed by examination with an otoscope and a course of antibiotic ear drops usually clears it up in one or two weeks. The most important consideration in external otitis is *prevention*. Careful attention to removing water from the ear after diving will eliminate almost all infections. Solutions such as Otic Domeboro can be used after diving to help remove the water and add

removed as soon as possible, otherwise ear injury will occur.

EARDRUM

The eardrum is injured in diving mainly by overpressure causing stretching and finally tearing of the drum. Squeeze on descent is the most common cause of ear injury in divers and occurs when pressure in the middle ear is not equalized to ambient pressure as you descend in the water. Figure 1 shows a schematic outline of the ear. You can see that the eardrum, which lies between your middle ear and the world outside, will easily become stretched when pressure is not balanced on both sides. Pressure imbalance occurs when the eustachian tube is blocked by allergy, colds or an inherited

(Continued on Page 34)

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Diver's Calendar

WATERMAN/BARBADOS

Stan Waterman will host his film show **April 4** on the island of Barbados. The event is sponsored by the Eastern Caribbean Safe Diving Association. Waterman is providing this service free of charge and proceeds from the event will go toward the purchase of equipment needed for the new decompression chamber on the island, which the ECSDA recently helped the Barbados Defense Force obtain. For information contact Martha Watkins Gilkes, c/o Captain D. Gilkes, LIAT, V.C. Bird International Airport, Antigua, West Indies. 🌿

DIVE TO ADVENTURE '86

The Wet Set Dive Club of Beaumont, Texas is sponsoring Jack McKenney, presenting his Dive to Adventure '86 film show **April 5** at the Beaumont Plaza Holiday Inn. Admission is \$7.50 and tickets are available at Davy Jones Locker, 6797 Eastex Freeway, Beaumont; Gulf Dive Shop, 901 Twin City Highway, Nederland; and the Holiday Inn. 🌿

FSDA U/W FILM FESTIVAL

The Clearwater Sea Bunnies dive club will host the XVI Florida Skin Divers Association Underwater Film Festival **April 11-13** at the Holiday Inn Cypress in Tampa, Florida. Reservations can be made in the name of FSDA at special rates. For information contact Ms. Patti Bacun, 715 1st Ave. NE, Largo, FL 33540. 🌿

UNDERWATER NY

Underwater New York, the 14th annual sport divers seminar, will be held **April 12** at the Holiday Inn, North St., Auburn, NY. For information contact Peter Odell, 81 Steel St., Auburn, NY 13021. 🌿

U/W EASTER EGG HUNT

The University of California at Santa Barbara Scuba Club will hold its annual Underwater Easter Egg Hunt **April 13** at Refugio State Beach. Prizes will be awarded to the buddy teams recovering the most eggs. For information contact Carolyn Darrow (805) 968-1378. 🌿

UNDERWATER OLYMPICS

The Second Annual Underwater Olympics, sponsored by the Academy of Scuba Training, Cape Girardeau, Missouri, will be held **April 19** at the Cape Central Pool, Cape Girardeau. The event will raise funds for the American Heart Association and DAN. For information contact the Academy of Scuba Training, Inc., 437 Broadway, Cape Girardeau, MO 63701; (314) 335-0756. 🌿

DIVE GEAR EXHIBITION/SALE

New England Divers' 13th annual Equipment exhibition and pre-season sale will be held **April 20** in Beverly, MA. There will be films, seminars and door prizes. For information contact New England Divers, 131 Rantoul Street, Beverly, MA 01915; (617) 922-6951. 🌿

WRIGHT STATE FLEA MARKET

Wright State University's Underwater Education Program will sponsor its fourth annual Scuba Flea Market and Diver Exchange **April 20** on the main campus in Dayton, Ohio. Films, slide presentations and demonstrations will be included. For information contact Dan Orr, Director, Underwater Education Program, Wright State University, Dayton Ohio 45435; (513) 873-2211 or 253-4568. 🌿

WHYDAH SLIDE SHOW

Barry Clifford, president of Maritime Underwater Surveys, will present an illustrated slide lecture on the pirate ship *Whydah* **April 25** at The Marine Museum at Fall River, Fall River, MA. For information contact Bob Cembrola (617) 674-3533. 🌿

RESEARCH DIVER COURSE

The Atlantic Alliance for Maritime Heritage Conservation, in association with Marine Resources, will present an introductory course in archaeological research diving **April 25-27** at Koblick Marine Center, Key Largo, FL. Duncan Mathewson, known for his work with Mel Fisher on the *Atocha* wreck, will present a series of lectures, labs and field trips. For information contact Tonya Koblick at Marine Resources, P.O. Box 787, Key Largo, FL 33037; (305) 451-1139 or (800) 858-7119 (in Florida only). 🌿

LOUISIANA DIVE FESTIVAL

Seven Seas of Baton Rouge, Louisiana will host its Third Annual Diver's Festival **April 25-27** in Baton Rouge. Lectures, films, slide shows and seminars will be presented. Jack McKenney will present his Dive to Adventure '86 film show April 26. For information contact Keith Sliman (504) 926-4036. 🌿

EQUIPMENT EXPOSITION

New England Divers of San Francisco, California will present its Third Annual Equipment Exposition and Giant Pre-Season Sale **May 16-17**. Major equipment manufacturers will be on hand to demonstrate their products. For information contact New England Divers, Inc., 398 5th Street, San Francisco, CA 94107; (415) 434-3614. 🌿

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Australia's Sports Suits

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TEXT AND PHOTOGRAPHY BY GERI MURPHY

From Australia, comes a new kind of dive suit so simple it almost defies logic. This full length suit will fit virtually any shape diver, weighs just a few ounces and can be folded up and stuffed into your pocket. Yet, this amazing suit provides insulation and protects the body from many types of marine life hazards. It is the most revolutionary dive suit development since the invention of the drysuit.

The Sports Suit is the invention of Tony Farmer, an Australian swimwear design-



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Our new Calypso is a major breakthrough in BC design. In fact, we're so confident that it'll beat anything on the market, we're putting our money where our mouth is. Just take the Calypso Challenge* and you could win \$5,000.

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Try a few wide-open arm circles and you're in for another pleasant surprise



—no more straight jacket restrictions, but a freedom of movement that'll make you wonder how divers put up with ordinary BC's for so long.

Notice, too, the streamlined low-profile design. It hugs your body for reduced drag. And it floats you higher above water for better visibility and surface comfort.

There's so much more we could tell you about the Calypso BC. But we'd much rather show you. Take the Calypso Challenge. You've got nothing to lose. And \$5,000 to gain. Contact your authorized Aqua-Lung Pro-Line dealer or U.S. DIVERS, 3323 W. Warner, P.O. Box 25018, Santa Ana, CA 92799-5018, or call (714) 540-8010.

*Entry forms and contest rules available at participating Aqua-Lung Pro-Line Dealers. Entrants must be either a certified diver or a student enrolled in a diving class. Contest ends June 30, 1986. Void where prohibited by law.

The new Calypso BC from
U.S. DIVERS®



Tony Farmer, president of Sports Suits of Australia, test dives the prototype Lycra suit in Hawaii. Preceding page: David Loughnan in a Sports Suit, Heron Is. Right: Anne Flinn wears one off Grand Cayman.

er and director of a company called Darling Designs. The suit was originally developed as a protective garment for Australian swimmers, not divers.

During the hot summer months, swimmers along the North Queensland coast are plagued by a nasty floating creature called the box jellyfish (*Chironex fleckeri*). This species is regarded as extremely venomous and is frequently lethal. Stings from box jellyfish tentacles have been described as burns from a red hot poker and the victim may die of shock within several minutes.

Farmer was seeking a protective garment that would allow swimmers to enjoy the water without risk of an accidental jellyfish encounter. He got the idea from observing some swimmers and surfers using pantyhose as makeshift swimsuits.

Farmer first tested his dive suit model in November 1982 while diving in Hawaii. He subsequently tested the suit in diving trials both in Australia and New Guinea.



Production models were released in June 1983. The Lycra suits have swept the Australian market in the last few years and are now the rage on the U.S. market.

The suit is made of a tightly woven Lycra/nylon material that is extremely elastic. It will easily stretch to fit the shape and contours of any person. Designed as a one piece garment with stirrup straps, it looks like skier's stretch pants. Matching gloves, booties and hood are optional. The suit is made with two basic neck styles; the warmer X-neck or a front-zip model (available in June).

The suit is available in eight different sizes that fit either men or women. Because the suits are manufactured in Australia, they are labeled with a size system that is unfamiliar to Americans; 10/12, 12/14, 14/16 and so on. For example, a size 14/16 would be the equivalent of a men's small or a women's large.

The color design for these suits is basically a solid color with a one and one-half inch wide, contrasting color stripe running down the outside of the arm, leg and torso. There are over a dozen different color combinations, including red, yellow, white, navy blue, silver, green, electric blue and black.

The suit functions as a mini-wetsuit, trapping a thin layer of water between the suit and the body, keeping a diver 25 percent warmer than without a suit. The suit definitely keeps you warmer. It is quite adequate for sport diving in tropical waters where the temperature ranges from 76-82°F.

In addition to warmth, the Sports Suit provides at least a dozen other benefits. It will protect a diver from jellyfish, stinging hydroids, fire coral, sea nettles and other types of stingers. It will also shield against sunburn when worn on the surface. The tough weave of the suit prevents cuts and scratches caused by light to medium impacts with sharp corals.

The suit can provide additional warmth by being worn under a neoprene wetsuit. When worn as an undergarment, the Sports Suit allows your normal wetsuit to slip on with amazing ease. It also prevents chafing and eliminates skin abrasions caused by a rough seam, stitching, or other wetsuit irritants.

The suit offers far less restriction than a conventional wetsuit—almost total freedom. It is extremely easy to slip on or off and dries very quickly after use.

The taut, sleek fabric makes the wearer look thinner and more attractive. It does for divers what stretch pants have done for skiers, and the bright colors allow easy identification underwater or on the surface in a rough sea or fog.

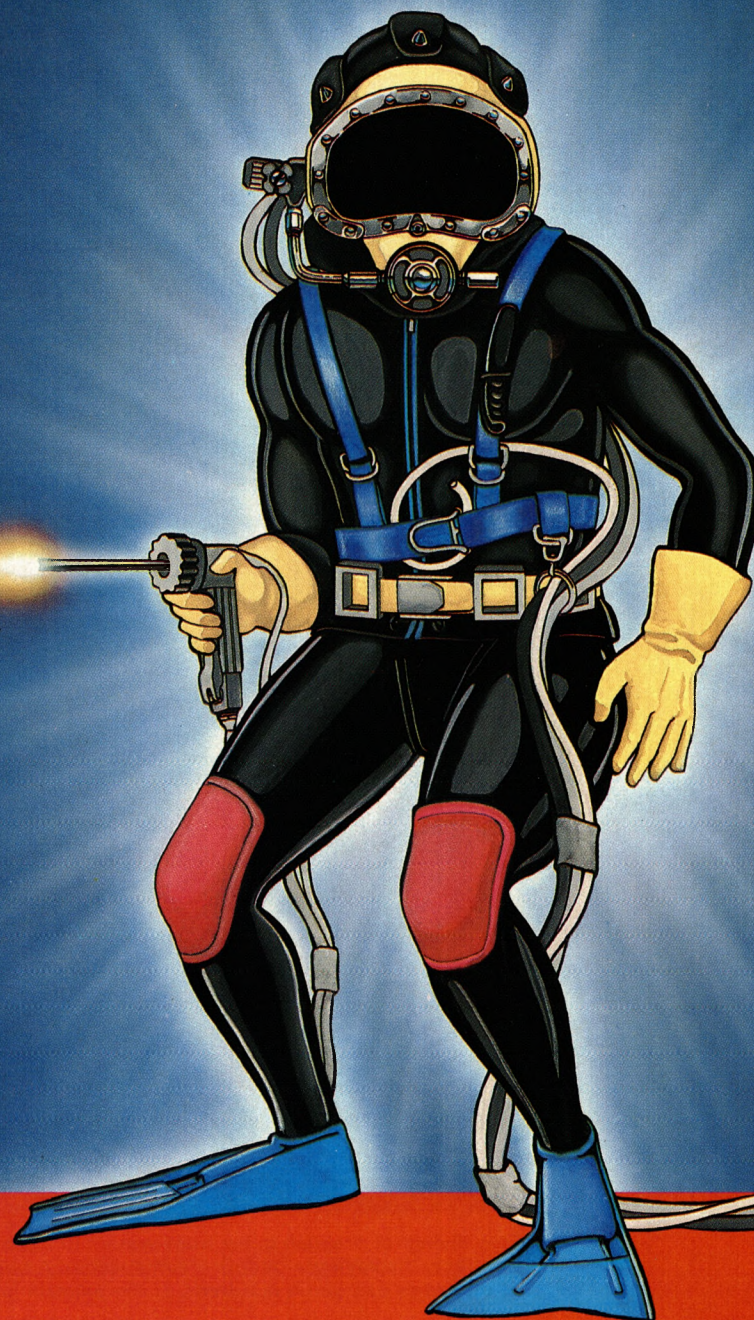
The Sports Suit is a valuable diving tool for serious divers. It is not a fashion fad, not a toy. This product is ideal for Caribbean or tropical water diving, but is not limited to warm water. When worn as a wetsuit or drysuit undergarment, this product provides additional warmth.

It is especially suited to the traveling diver, since it is featherlight (less than nine ounces) and packs into a tiny space. I usually stuff it into my fin footpocket. By the way, the suit does not wrinkle.

The Sports Suit is inexpensive when compared to other types of diving suits. Suits sell from \$89 to \$99 depending on neck style. Children's sizes are \$20 less.

For more information, check with your local dive store dealer or contact: Sports Suits of Australia, P.O. Box 1022, Reseda, CA 91335; (818) 708-8136. 

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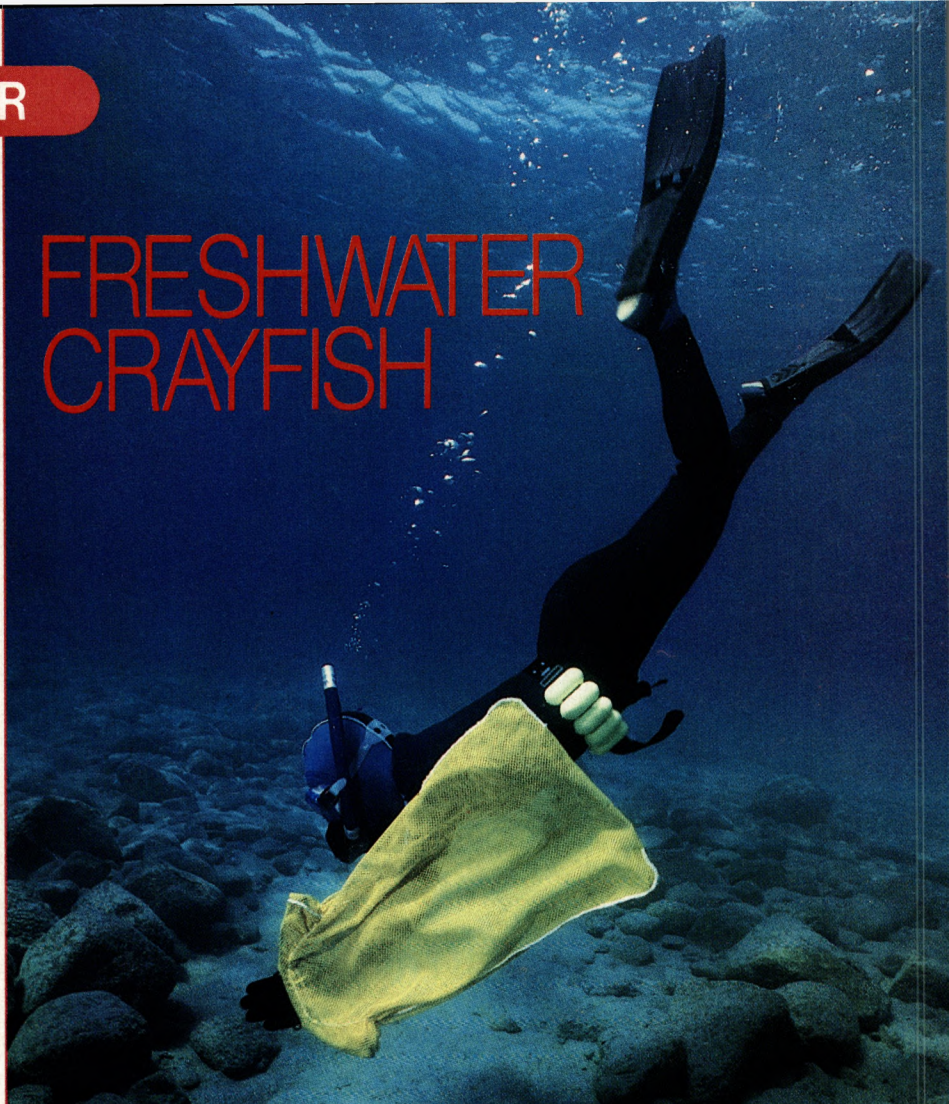
TEXT AND PHOTOGRAPHY BY BRUCE WATKINS

There exists in the lakes, rivers and streams of the United States a freshwater cousin of the lobster. Whether called crayfish, crawfish, crawdads or freshwater lobster, these tasty little creatures can make a mighty fine meal with a flavor quite similar to their saltwater counterparts. For some unknown reason, and with very few exceptions, this delicacy is often regarded as trash fish or even a pest in this country.

Freshwater crayfish are actually more closely related to the New England lobster (*Homarus americanus*) than they are to the spiny or slipper lobsters (*Panulirus sp.* or *Scyllarides sp.*) or to the shrimps. All of these crustaceans belong to the order Decapoda in that they have five pairs of legs. This is a large and diverse order, including not only lobsters but the shrimps and crabs as well. The New England lobster and freshwater crayfish are grouped into Astacura while the spiny and slipper lobsters are found within Palinura. The scientific distinction between these is in the way in which the head appendages are shaped and assembled; and, curiously, has nothing to do with the presence of large, crusher claws.



For the most part, crayfish (eg. *Pacifastacus sp.*) exhibit typical decapod development. Mating takes place in the fall and the females store the sperm until winter, at which time the eggs are released and fertilization occurs. The egg mass is then attached to the underside of the tail and the female provides a constant supply of fresh, oxygenated water by rhythmic beating of the swimmerets. The eggs are



Top: Free diving for crayfish in the brisk waters of Lake Tahoe. Above: A diver ascends to the surface, displaying a double crayfish catch. A bucket of crayfish. In Lake Tahoe, a few free divers can catch hundreds of the animals in an hour. Left: Crayfish Creole.

ready to hatch the following spring and the resulting development of the offspring distinguishes crayfish from their saltwater counterparts. The saltwater species release the young as larval forms, which develop into adults as they drift with the plankton. In freshwater species (eg. crayfish) the young emerge from the eggs as miniature versions of the adults, without proceeding through a larval stage. This is a necessary adaptation in the evolution of the freshwater species, because as the saltwater ancestors began to migrate into rivers, their young would be swept back

to the sea. The young crayfish still cling to the underside of the female for several months as they grow. During this time they molt frequently and are vulnerable to predation. Crayfish may take as long as four years to mature—depending upon water temperature and food availability—and can reach eight inches in length.

Crayfish occur throughout the world and, particularly in Europe, are prized for their food value. In the United States this delicacy has generally been overlooked with the exception of Louisiana. Here over 10 million pounds of the red cray-

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CRAYFISH

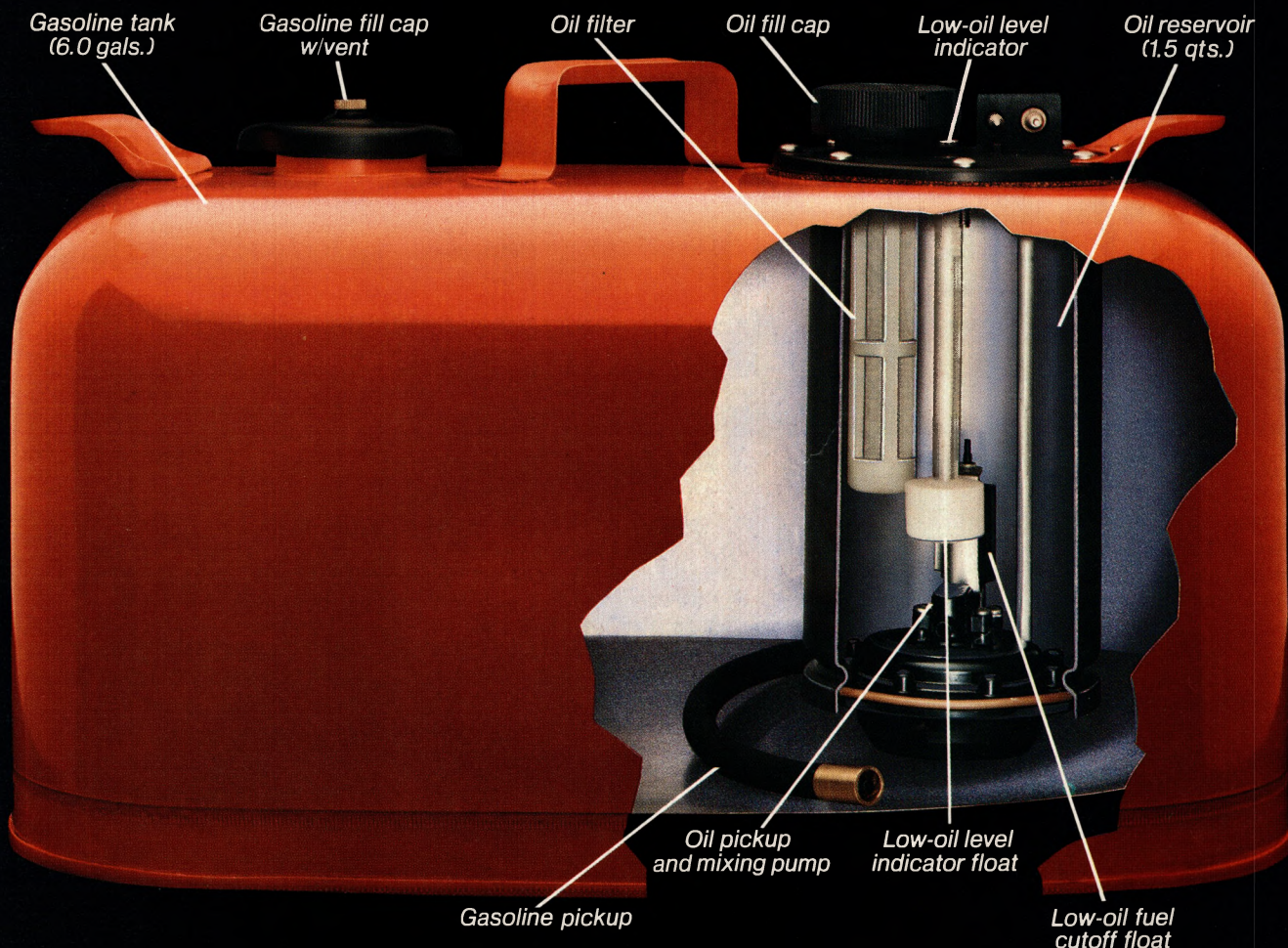
fish, *Procambarus clarkii*, are harvested annually for local consumption. The animal has been a long-standing part of Cajun and Creole cuisine. This species of crayfish has invaded the rice fields of Southern California and is generally regarded as a pest. In the other states, crayfish are mainly sought for bait or for export with very little being consumed locally. The Sacramento delta region of California supports a large commercial fishery of the signal crayfish (*Pacifastacus leniusculus*) with an annual harvest of over 500,000 pounds, almost all of which is exported to Sweden. It seems that the Swedes have had a long standing taste for crayfish but their local fishery of *Astacus astacus* has been steadily declining because of a fungus infestation.

The signal crayfish is native to California and because of its hardiness is displacing other local species. It was first introduced to California's Lake Tahoe from the Klamath River during the 1800s and has thrived there ever since. Nestled high in the Sierra Nevada Mountains at an altitude of 6,225 feet, the lake's cold, clear, nutrient-poor water is a hostile environment for crayfish, but this species has adapted quite well. Because of the similarity of Lake Tahoe to Scandinavian lakes and the resistance of *Pacifastacus* to the European fungus, numerous transplantations of *Pacifastacus* have occurred throughout Sweden, with the hope that it will displace the local *Astacus* and rejuvenate the fishery.

Crayfish are normally captured with the use of baited traps or hoopnets. (A small can of cat food with a few small holes is reported to be the best bait.) They are found in shallow, silty ponds or slow moving streams, places not normally considered to be great dive sites. With its crystal clear water and high crayfish population (about one per square yard) Lake Tahoe provides a wonderful exception. For those of us who are accustomed to free diving for abalone on the northern coast of California, where the ocean can look like small mountain ranges moving toward the beach and the visibility might be two feet; or bug diving in Southern California, where one might see a lobster or two, crayfish diving at Tahoe is refreshing indeed.

Crayfish are nocturnal omnivores and spend most of the day in burrows dug out under rocks. This behavior protects them from their most common predator, the lake trout. Even during the day crayfish can be seen foraging in open sandy areas on algae and dead fish. These are usually the larger individuals, who can more easily fend off a hungry trout. Areas with rocky bottoms (for cover) are neces-

(Continued on Page 32)



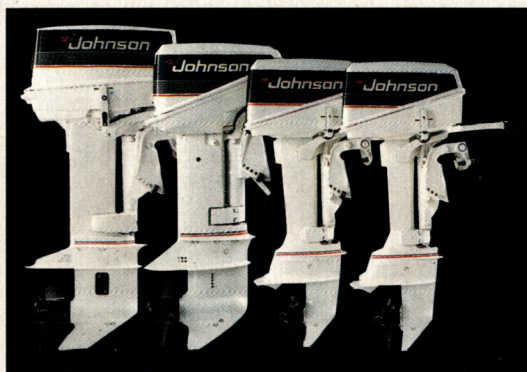
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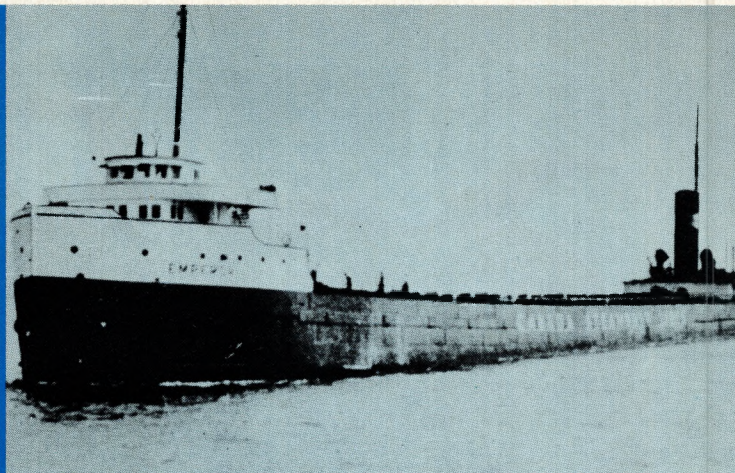
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Return To The EMPEROR

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TEXT AND PHOTOGRAPHY BY MYK GARN



It was dark; we stood with our eyes riveted to the radar screen. Outside, the fog was so thick we only caught an occasional glimpse of the bow lights. The chug of the engine was slow as we inched our way along the rocky coast toward the Windigo dock, on Isle Royale National Park, Lake Superior.

The phosphorescent screen glowed with the changing features of small islands, fingers of the mainland and other hidden dangers. Our captain, Larry Sands of Superior Diver Charters, appeared relaxed, but the intentness of his concentration on the radar and depth meter told of the skill needed to navigate these waters in such weather. Suddenly the whine of a racing motor cut through the fog and a new blip showed on the radar screen.

"He's moving fast," someone offered.

"Too fast," Larry said. "You see this?"

We followed the point of his finger to a tiny pulsating dot in what otherwise was a clear expanse of the channel.

"Bottom here runs 200 feet or better but these rocks, Canoe Rocks, rise straight up out of that to about three feet above the surface."

This new blip was heading straight for them, full speed.

We were silent, listening to the other motor; watching the two blips, one never moving, the other cruising full-throttle, drawing closer on each sweep of the radar. Larry picked up the marine band radio and tried to raise the vessel, but there was no reply.

Suddenly, as we began to alter our course toward the imminent crash and the two dots were about to become one, the motor's scream dropped off.

A deafening silence overcame our fog-padded cabin and the two blips separated again. We all began to breathe.

"Guess he saw it in time," Larry said, matter of factly, and we headed into safety at the Windigo dock.

I was diving on Isle Royale with Larry Sand and Bill Merrill of Grand Portage, Minnesota. We spent five days diving from their charter boats the *Superior Div-*

er and the *Royale Diver*. Diving wrecks off Isle Royale—the *Monarch*, *Congdon*, *Cod*, *America* and *Chisolm*—was enough to excite any diver.

But one wreck drew us more than the others. Nicknamed the "Pride of Canada" when she was launched, she was 526 feet long, 56 feet in beam and 31 feet in depth, the first of the 10,000 ton lakers. Her 1,500 horsepower triple-expansion steam engine could power her to 11.5 nautical miles per hour. Built in 1911 by the Collingwood Ship Building Company of Collingwood, Ontario, the steel steamer worked for the Canada Steamship Lines of Montreal. Her name was fitting for her status among the royalty of shipwrecks, she was the *Emperor*.

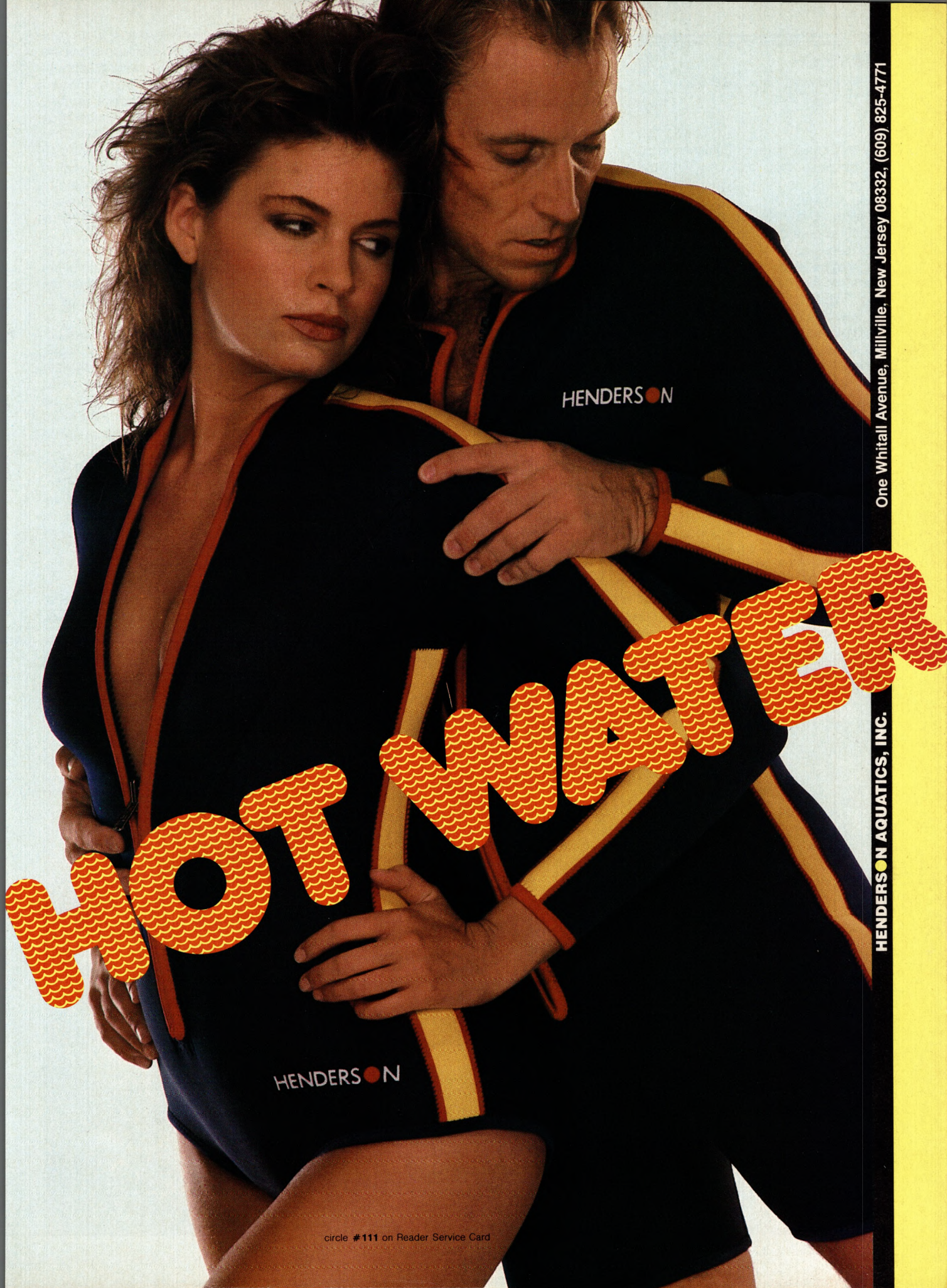
June 3, 1947: At 10:55 pm the *Emperor* backed away from the ore dock at Port Arthur and slowly rambled into the night for her downlake run. At midnight, the first mate James Morrey relieved Capt. Eldon Walkinshaw of his watch and settled into his chair. Visibility was excellent, navigation lights on Passage Island were clearly in view. But Morrey, who had supervised the loading during the day of the 10,429 tons of ore she was carrying, fell asleep. Consequently, a course change that should have been made abreast of Thunder Cape Light wasn't made until the *Emperor* was passing Trowbridge Island Light, three miles farther. Her course thus altered, she headed directly toward the northwest side of Isle Royale.

On June 4, at 4:55 am, the *Emperor* ran hard up on Canoe Rocks. The icy waters of Lake Superior are not forgiving of such errors and there was no reprieve. In 25 minutes the *Emperor* slipped below the surface. Nine men and three women, James Morrey and Capt. Walkinshaw among them, went down with her. She lies today with her bow in 35 feet of water, broken to hatch seven from the crash and subsequent ice damage. From hatch seven to the stern, which lies in 180 feet of water, she is totally intact. As a diver dropping down those long, dark feet to her aft decks, I gained memories that have stayed with me to this day. x



Above: A diver at one of the two large anchors on the *Emperor's* bow. Below: A sink inside one of the vessel's crew cabins. The huge bow winch lies exposed, the deck ripped away by winter ice.





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CRAYFISH

(Continued from Page 28)

sary to support large populations of crayfish because they are very vulnerable during their molting cycle when their shells are soft.

California law requires a sport fishing license to take crayfish. There is no size or possession limit and at Lake Tahoe they may be taken from one hour before sunrise to two hours after sunset all year long. Traps or nets not exceeding three feet may be used as well as skin and scuba diving equipment. These laws change frequently, so consult the most recent Fish and Game Regulations before taking any game.

Members of our diving club, the Vaqueros del Mar, have a crayfish dive/cookout each year at Lake Tahoe. These divers are used to free diving for abalone and prefer to do the same for crayfish. Because the lake is more than a mile above sea level, consult high altitude dive tables before using scuba. The entire shoreline of the lake supports a large population of these crustaceans and all one has to do is grab a goodie bag and swim out. The highest populations of crayfish generally occur in rocky areas in about 5-15 feet of water. During the day,

search for the larger animals in open areas and under mid-sized flat rocks (it's easier for a crayfish to make a burrow under a flat rock). Slowly turn over the rocks and grab the crayfish as they run for cov-

BOILED CRAYFISH

Thoroughly clean two pounds of live crayfish and remove the tails. Remove the shell and intestinal vein. The intestinal vein usually comes off in one piece by grabbing the center tail flipper and peeling it down the back. Bring a quart of salted water to a boil. Add a little lemon juice, beer or white wine and then the cleaned tails. Boil the tails for 7-9 minutes, being careful not to overcook. Serve with melted butter and cocktail sauce. Serves four.

SAUTEED CRAYFISH

Thoroughly wash about two pounds of live crayfish and remove the tails. Melt one stick of butter in a frying pan and add one small, chopped onion, two or three crushed cloves of garlic and a dash of dill. Saute until the onions become translucent and then add the crayfish tails. Saute until the shells have that characteristic pink color of cooked shrimp (about 5-7 minutes). This is good "finger food," as removing the shell can be a little messy. Remember to remove the intestinal vein. Serves four.

er. Sometimes they will sit quietly as their rock is removed, so it is wise to allow the sand to settle and look around a little before moving on. Conservation minded divers always replace the rocks as they find them and release females with eggs or young.

There are two basic approaches to grabbing crayfish. In one the animal is engulfed by a one-handed grab. The other requires a little finesse and involves grabbing the animal from behind and by the carapace with two fingers. Both of these approaches are designed to avoid being nipped by the pinchers—painful but not fatal. The first approach requires the use of gloves, but they generally get in the way of the second.

If you're not into overturning rocks underwater you might try diving at night. This is when the crayfish come out into the open to forage. Look in sandy areas around fishing piers where they can be found in huge concentrations. Fifty or so are required for a meal and can easily be gathered in an hour or two.

There are a great many ways to prepare crayfish and any recipe for either shrimp or lobster may be adapted since the flavors are so similar. An entire book has been written on the subject: *Louisiana Crawfish Cookbook*, by Bunny Jumonville and Joy Mounger. My favorite recipe is that for Cajun Popcorn (from the book *Chef Paul Prudhomme's Kitchen*), sometimes simple recipes are best.

SPORTS SUITS



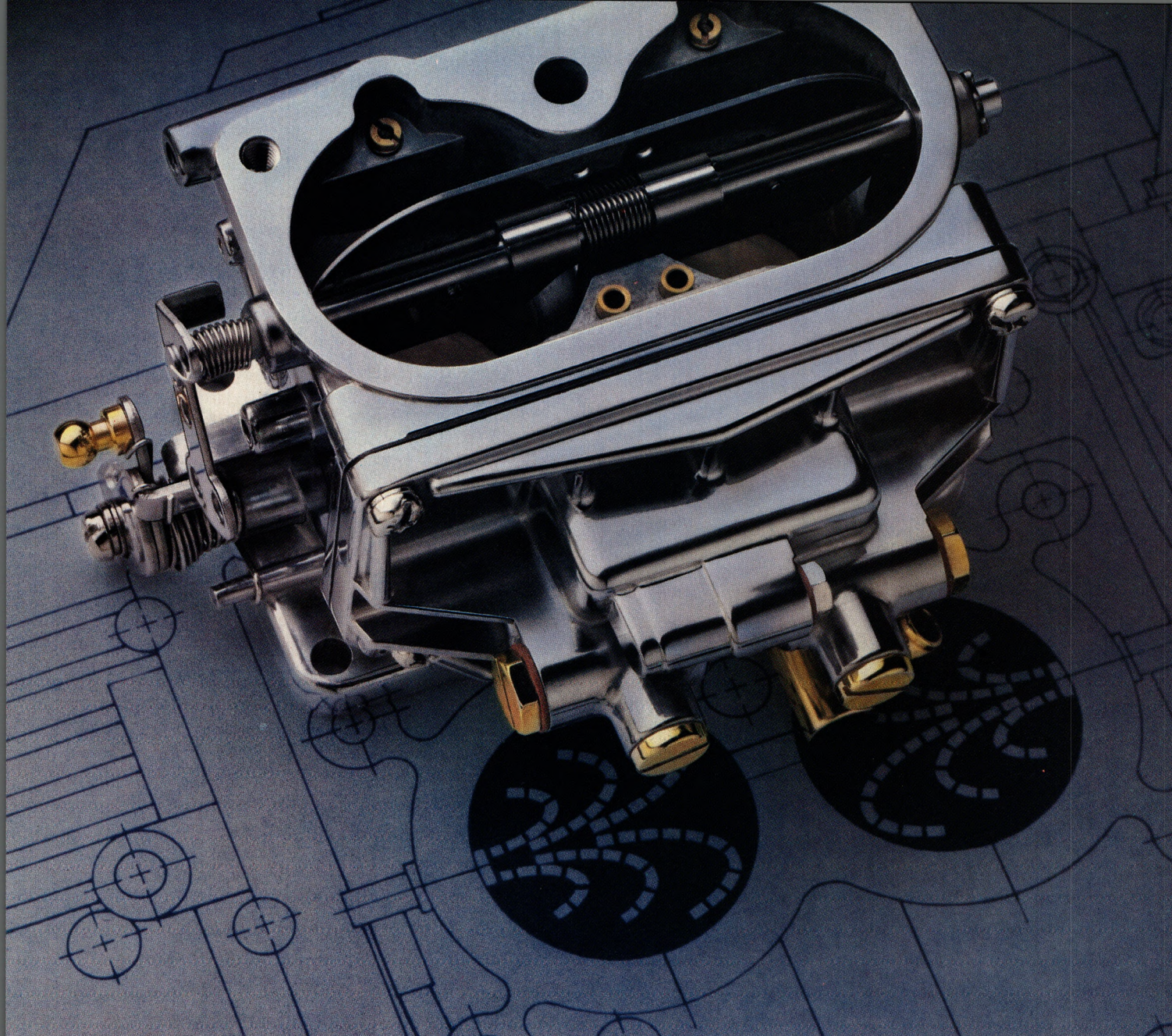
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DIVING MEDICINE

(Continued from Page 18)

tendency to be uncooperative during ear clearing maneuvers. As pressure increases outside the middle ear, the eardrum is forced inward and is stretched until it tears. You should feel pain in the uncleared ear long before you are at risk of rupture. To avoid ear injury it is necessary to respond to the ear pain by stopping your descent, then ascending four or five feet, equalizing pressure in your ear, then descending slowly. A good habit is to start equalizing pressure in your middle ear while still on the surface, then continue to equalize as you descend. If you wait until pain occurs, you have locked the eustachian tube and must ascend to equalize before descending farther. Considerable hemorrhage occurs with severe pressure injury and the drum can be ruptured.

The normal eardrum will continue to work for you if you do not damage it. If it ruptures, diving is out of the question for several weeks. In some cases the eardrum may not heal; but the majority of ruptured eardrums will return to normal within weeks. Diving with a ruptured eardrum will cause water to enter the middle ear. This usually results in an infection.

MIDDLE EAR

This is a space between the eardrum and the inner bony wall of the skull. Within the space are the small bones that transmit vibrations from the eardrum to the organ of hearing, which produces the perception of sound. Adjacent to the middle ear are three semicircular canals within the bony wall of the middle ear. These canals are oriented at right angles to each other and are the organs of balance. They contain nerves that sense motion and position. If they are stimulated by cold water on one side only, they will produce a sensation of turning (vertigo). When an eardrum ruptures, a common accompaniment is vertigo, owing to cold stimulation of the balance system. The accompanying disorientation can produce a serious accident if panic occurs. The only outlet of the middle ear to ambient pressure is through the eustachian tube (Figure 1). This is the narrow passage that leads to the back of the throat. It can become blocked easily during descent. You cannot dive safely with a blocked eustachian tube. If you dive with a blocked eustachian tube, a ruptured eardrum is likely. Test your eustachian tube frequently by attempting to "pop" your ears on the surface.

ROUND WINDOW

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DIVING MEDICINE

the inner ear. It also helps to equalize pressure between the middle ear and inner ear. The membrane of the round window, like the eardrum, can be torn by the force of pressure changes. When it ruptures, there is a sudden feeling of vertigo, loss of hearing and a buzzing or hissing sound in the injured ear. The ruptured round window, if not repaired, can lead to permanent deafness.

The injury occurs usually on descent when there is difficulty in clearing the ears. By forcefully bearing down (a Valsalva maneuver) to clear your ears, pressure within the inner ear can be increased while pressure in the blocked middle ear is below ambient pressure. The pressure difference across the round window membrane may become high enough to rupture the membrane. A round window rupture usually must be repaired surgically. Diving at all after round window rupture is not advisable. Flying should be avoided for several months.

INNER EAR

Injury to the inner ear in sport diving is uncommon. Both the hearing and the balance organs of the inner ear can be injured by decompression sickness, but this type of injury is found mainly in deep saturation diving. Injury to the inner ear from decompression sickness often leads to permanent, total deafness in the injured ear.

This brief review of the ear is aimed at providing an understanding of the most common medical problem in diving. Prevention of ear injury during diving is not difficult and the small investment in time and effort required to keep your ears healthy is well spent.

LETTERS

Question: I recently had a degenerated hip joint replaced. I've been diving for 20 years. Can I continue?

Answer: There are many people who have artificial hip joints (total hip arthroplasty). I have heard of a few who returned to sport diving with no problems. As long as you are not going to do deep decompression diving you should be able to dive with no problem.

Although there is a known risk for aseptic bone necrosis from diving, the only cases recorded have been from caisson workers, deep mixed gas saturation divers and deepsea air divers who had a high incidence of bends during their diving careers. These latter did not adhere to tables for decompression.

Question: I tend to get nervous and have been able to avoid this by taking Valium. Sometimes I feel nervous when beginning a dive and find myself hyperventilating. Is there any problem with taking Valium before a dive?



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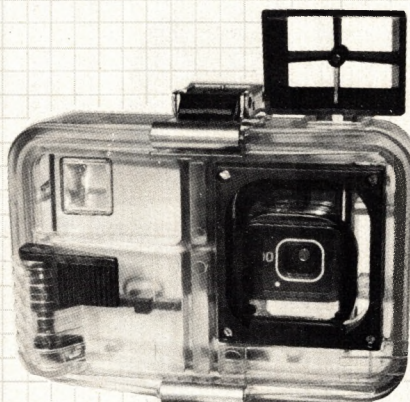
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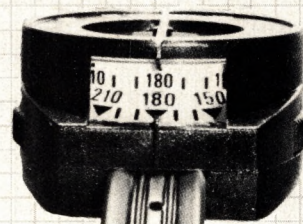
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PRO COMPASS

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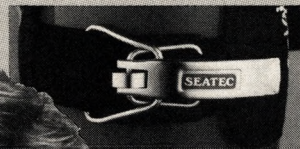
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DIVING MEDICINE

Answer: Using sedative or tranquilizing drugs while diving is a dangerous habit for several reasons. There have been well recorded incidents of divers developing severe nitrogen narcosis at shallow depths (70-80 feet for example) when taking tranquilizers. My advice is to make every effort to avoid the use of Valium when diving. Your excitement prior to diving is shared by many who do not feel they need a tranquilizer to overcome the feeling.

Incidentally, there have been several studies that indicate an exercise program is very useful for overcoming the mild anxiety you have when diving and even in your business environment. You might try getting into an exercise program as an alternative to using tranquilizers.

Use of four to six tablets per month is quite reasonable; however, I suggest that you avoid them before diving.

Question: I hear there is a drug for seasickness that is worn as a patch on the skin. Is this useful for divers and are there any problems with it?

Answer: The new Transderm patches containing scopolamine are being used by divers frequently and there are mixed comments about their effects. They will clearly reduce the incidence of motion sickness, as scopolamine has been known for many years to be useful in alleviating this disorder.

The major problem with the Transderm patch is the possibility of an overdose occurring because of a mismatch between the amount of drug in the patch and the sensitivity of the user. The most common problem is the use of the patch on children or small adults where the total dose of the drug is too much for that individual. If you and your wife weigh more than 110-115 pounds, there should be no problem with the drug dose. Another problem is changes in vision. This occurs because of hand contact from patch to eyes. This problem can be avoided by suppressing the urge to rub the patch area, then rub the eyes. You will have a dry mouth from the drug, as this is part of its action, but most people tolerate this without problems. Rarely, scopolamine can produce a psychedelic response, but this is uncommon and usually related to the higher doses used for sedation.

Overall, I would suggest you try the Transderm before you go on vacation. It clearly helps with motion sickness and if you are tolerant to the side effects mentioned above, it would be useful during your diving trip. As with any drug, there may be an interaction with nitrogen at depth to aggravate nitrogen narcosis. You should avoid depths greater than 100 feet, which is good sport diving practice anyway.

(Continued on Page 139)

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WRECK FACTS

(Continued from Page 16)

from Liverpool to Savannah in ballast (no cargo). The wreck is in 20 feet of water on Stone Horse Shoals, three miles off Tybee Island, Georgia.

Spence's other find is the sailing ship *Canterbury*, off Beach Hammock and Tybee Inlet on the south end of Tybee Island. Sunk in 1875, the *Canterbury* was heading for Russia with a full load of cotton. The wreck caught fire during salvage efforts several days after she ran aground. Working 21 feet deep, divers retrieved many pieces of melted glass—clues to the burning. Details of salvage efforts on the *Canterbury* were found in the Savannah Morning News of 1875.

John Daniels writes all the way from Jakarta, Indonesia where he is helping organize cruises aboard the 130 foot, jet driven, twin-hulled M/V *Island Explorer*. Shipwreck exploration will be one of many diving thrills offered by the ship's crew for 36 passengers who will explore some of Indonesia's 13,677 islands. Indonesia was called the Spice Islands in early days when fleets of ships sailed routes from Europe to China. The *Island Explorer* will be home based for nine months in Bali where it will cruise Indonesia's eastern islands. In November the

vessel leaves for the Great Barrier Reef, then visits Raine Island, the world's largest breeding ground for green turtles. After a stop in Cairns, Australia, she returns to Bali to resume diving the islands of Indonesia. Details and prices may be obtained by writing to: John Daniels, P.O. Box 98MT, Jakarta Selatan, Indonesia; phone 516202 or 516204.

Mel Fisher's famous treasure galleon, *Atocha*, is in the news again, but this time it's not sunk off the Florida Keys. It's loaded on the bookshelves of Val Martin's Florida Classics Library—247 pages entitled *The Search for the Atocha* by Eugene Lyon. The author's research in the Archives of the Indies, Seville, Spain, played a major role in the dramatic conclusion of the 16 year search for the treasure galleon that captured the fancy of people all over the world. This is the story leading to the discovery of the *Nuestra Senora de Atocha*. The Florida Classics paperback has a dramatic cover depicting the galleon listing in a violent sea, its sails shredded and crew overboard. Author Lyon includes a fold-out replica of the original Spanish salvor's chart dated 1623. The book sells for \$9.95 from: Val Martin, Florida Classics Library, P.O. Box 1657, Port Salerno, FL 33492-1657.

West Coast divers will be pleased with the new *Diver's Almanac* published by Sports Almanacs, Inc., Medford, Oregon.

The 200 page book has been expanded to include Baja California and the Sea of Cortez, making it a guide to the West Coast from Baja to British Columbia. It includes everything from dive sites to medical advice, safety tips and facts on tides, winds and currents. The shipwreck section, *Shipwrecks of the West Coast*, covers the *Olympic II*, *Valiant*, *Winfield Scott*, *Equator*, *Golden Horn*, *Star of Scotland*, *Avalon* and many other California wrecks. Washington and Oregon wrecks are included, accompanied by a list of references for shipwreck research. The book may be ordered from: Sports Almanacs, 1322 E. McAndrews Rd., Suite 201, Medford, OR 97504. The price is \$18.95 plus \$3.50 postage and handling.

Ed Monk called from New York City. A friend of Ed's is heading for St. Eustatius, (see the Geri Murphy article on this island in this issue) and wants to know about shipwrecks there. I found St. Eustatius in *Shipwrecks in the Americas* by Robert Marx, with ten ships from 1690 to 1792 listed as wrecked off the island. This book and others on ships, wrecks and nautical archaeology may be ordered from: Adventure Books, 2 Coachman's Square, New Canaan, CT 06840. Write and ask for their ten page brochure.

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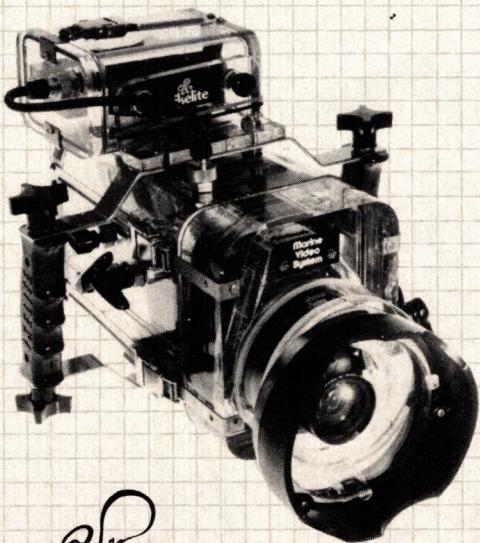
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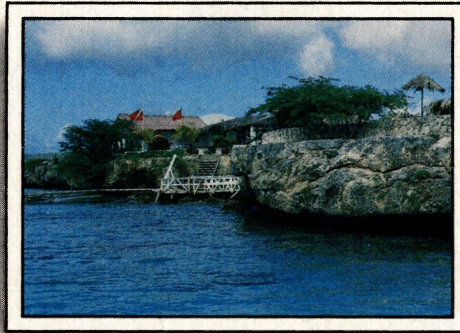
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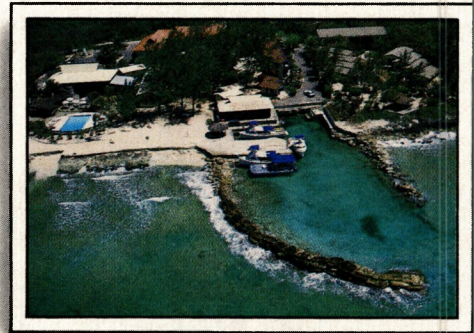
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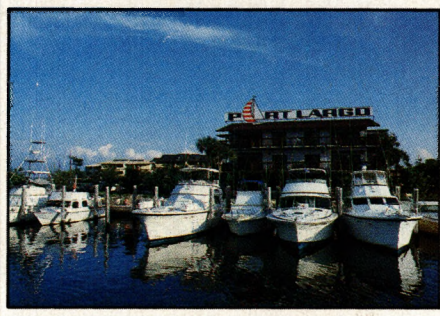
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THE INFLATABLES

The Zodiac Pro 530



A Trailerable Boat With A Semi Rigid Tri-Hull

TEXT AND PHOTOGRAPHY BY GEORGE COZENS

After a lousy week, weatherwise, Saturday morning looked promising—in fact, it looked absolutely gorgeous. Two friends, Jan Tunnicliff and Vicki Van Ars-dale, joined me in Long Beach, CA and we drove on down to Port-A-Marine in Costa Mesa, a dealer specializing in the sales and service of inflatable boats. There we became acquainted with Scott McIntosh and Pete Ely of Port-A-Marine; Bill Mow, the area sales manager for Zodiac of North America; two prospective inflatable buyers; and the Pro 530. After brief introductions and some shuffling of gear, we were off for the backbay of Newport. Bill's late model Ford Tempo, with a four cylinder engine, towed the Pro 530 easily. This doesn't require much power; as tested, with an 85 hp Suzuki DT85 engine, the boat weighs only about 1,000 pounds.

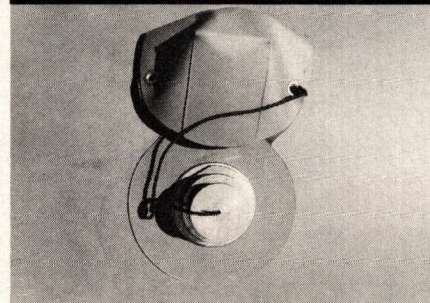
"Towing" and "trailerable" are key words when talking about the Pro 530. Although the tubes can be removed from the hull—they slide into anodized aluminum tracks just like an awning—not much is gained. Most of the boat's 539 pounds are in the rigid hull. Nor is any significant reduction in space achieved. So, disas-

sembly of the boat doesn't make it much easier to handle or store. Indeed, the Pro 530 was designed to be left assembled, with transporting, launching and storing to be done on or from a trailer.

Now, perhaps, an important question arises: Why compromise with a boat that's halfway between a typical soft inflatable and a completely rigid hull? The answer is the Pro 530 combines some of the best features of both styles. It bridges the gap between the soft and hard hull extremes. Compared to a rigid hull, the Pro 530 has much less weight, a shallower draft, a far greater carrying capacity/payload, and is more stable in the water when not underway. Also, it is safer: There are five chambers in the tubes, separated by flexible partitions to help equalize air pressure; plus a sixth sealed compartment in the rigid, fiberglass bottom section. Even with a couple of these air chambers punctured and leaking, the boat would stay afloat! At the recommended air pressure of 1.5 psig, should a minor puncture occur in one of the tubes above the waterline, there's a good chance it could be fixed before much air was lost. Compared to an all-inflatable



The Zodiac Pro 530 combines a rigid hull with inflatable tubes. It can handle an outboard up to 120 horsepower and can be trailered by a small car. The inflation valves are stainless steel.



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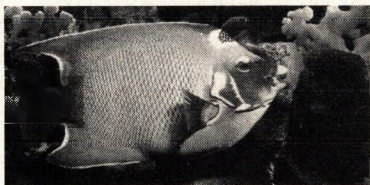
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ZODIAC PRO 530

boat, the Pro 530 is more comfortable underway (less bounce), has greater speed potential, is more maneuverable at speed (straighter tracking and tighter turning) and is easier to get ready and to clean up after use (no floorboards to set up, remove or clean, etc.). The best argument is, probably, "Test ride it!" This brings us back to where we left off.

Launching was clean and simple. Even with the heavy, 271 pound engine on the stern, the rear tubes provided enough buoyancy to float the Pro 530 in reasonably shallow water. The ride through the backbay and Newport Harbor was comfortable. Once past the jetty, however, the Zodiac turned into a racing machine as Bill hit the throttle. In an incredibly short time the boat was skimming over the calm water at an estimated speed of 40 knots. Laguna Beach was abeam in no time. Slowing a little, Bill made some sharp turns. Impressive! The effect of this hull was evident: The Pro 530 seemed to almost pivot on its V-shaped chine. With the ocean so smooth we later went looking for larger vessels in the area just so we could cross their wakes. Overall, the test ride was fun and exciting—like riding in a fine sports car. But don't take the

analogy too far. This boat was designed to handle work as well as recreation.

Zodiac, with more than 50 years' experience in designing and fabricating inflatable boats, spent a lot of time and money in the development of the Pro 530. It isn't just a marriage of air tubes to a hard bottom. According to Zodiac, the Pro 530 is the first and only inflatable designed as an integrated system. The combination of tubes and rigid tri-hull were designed by naval architect Jean Berret to complement, not compromise, each other. The Pro 530 is equally at home towing a waterskier as it is hauling a group of divers to an offshore site. The two prospective buyers mentioned earlier want to capitalize on the safety and security of their new inflatable for exploring the coastal and inland waters of Alaska. The potential applications of such a boat are almost limitless. Such things dreams are made of.

Some of the Zodiac Pro 530's features are listed in the specifications box. But these don't tell the whole story. The fabric in the tubes is woven from a special polyester Zodiac calls Strongan Z. It has 11 warp yarns and 11 weft yarns to the square centimeter, with each yarn having a decitex of 1,100. Decitex is the weight of the yarn, in grams, per 10,000 meter length and is the newer unit of measure, replacing denier (the yarn weight per 9,000 meters). The fabric is given multiple layers of a plastomer coating—each applied as a liquid—then rolled smoothly

into the fabric and cooled in a process called calendaring. Seams in the tube construction consist of thermo-bandaging, where sealing strips are applied to

ZODIAC PRO 530

Length:	
Exterior	17' 5"
Interior	14'
Beam (overall)	7' 11"
Tube diameter	1' 10"
Number of chambers	5
Air pressure	1.5 psi rec., 5 psi max.
Draft	8" (approx.)
Capacity:	
Persons	10
Divers	6 to 8*
Payload	2,200 lbs. max.
Horsepower	120 hp max.
Total weight	539 lbs.
Portability	Trailerable
Colors:	
Tubes	Red/black trim
Hull	White

* Depending on distance, amount of equipment and degree of friendliness.

both the inside and outside of the seam line and then thermo-fused to the main tube fabric in a continuous electromechanical process. Zodiac has found that this material and construction method produces a consistently higher standard of quality, including: higher resistance to chaffing and ultraviolet radiation, greater air tightness and longer life. The hull is molded of fiberglass and is composed of



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tem, for increased strength; and a balsa core fiberglass deck with non-skid surface. The transom is an integral part of the deck, shaped for greater strength and well drained by two self-bailers. The out-board perimeter of the tubes has a rubbing strake, half round in shape to deflect water. Around the entire topside of the tubes runs a lifeline, tied at intervals to the lacing cuff. This arrangement provides a place for passengers to hang on; an attachment for tying off dive equipment (e.g., for securing tanks when the diver wants to get out of the water); and additional protection against water splashing into the boat. Each of the five air chambers has its own stainless steel valve. These are easy to disassemble for cleaning or to speed dumping of the air. Two stainless steel lifting eyes are secured to the hull, forward, and two more are mounted in the transom. These last two eyes come in handy for pulling a water skier. Additionally, a stainless eye is attached low in the bow stem for towing.

Standard equipment includes: a foot pump; a pressure gauge; a repair kit; and two wooden paddles, which store unobtrusively on the inboard sides of the rear tubes. Pro 530s imported to the USA will have fiberglass steering consoles.

The test boat we used is the first in this country. By the time this article is published, routine imports should be well underway. Retail price in the U.S. is expected to be about \$6,500. A five year limited warranty will cover fabric, materials and workmanship. For sales and service, Zodiac has an extensive dealer network worldwide, with more than 100 dealers in the U.S. alone. For more information contact your local Zodiac dealer, or Zodiac of North America, P.O. Box 400, Stevensville, MD 21666.

Overall, I was very impressed with the Pro 530. It was really fun to test ride; appears extremely well made; carries the Zodiac reputation for quality materials and construction; and is designed to fulfill just about any diving application imaginable. If asked to fault the boat, I can think of only two shortcomings: The operator has no place to sit at the console and, except for the two forward lifting eyes, there are not enough equipment tie-downs. But these could be easily resolved by the dealer or a resourceful owner. Test ride the new Zodiac Pro 530. It just may bring new excitement to your diving. 

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CROSS RECEIVES AWARD

A byline divers have seen on SKIN DIVER's Technifacts column for more than 20 years—E.R. Cross—came alive at the recent NAUI International Conference on Underwater Education (IQ) in San Diego, California.

Larry Cushman, president of The Ocean Corporation and past president of NAUI, presented a special award to Cross. In doing so, he outlined an incredible diving career that began when Cross started diving in the South Pacific in 1935 while in the U.S. Navy. Later, during WW II, he served aboard Navy salvage diving ships in the Pacific and Atlantic theaters, mainly doing combat-area salvage work and fighting oil tanker fires caused by German U-boats.

After the war Cross received a Navy commendation for his participation in the Bikini atomic bomb tests, and was commissioned as a line officer. He was then assigned to the Navy Salvage School where he started training Navy divers and developing new training programs.

In 1947 Cross transferred into the Navy reserve and helped a friend expand the first commercial diving school, the Sparling School of Diving. A year later he became owner/director. During the next

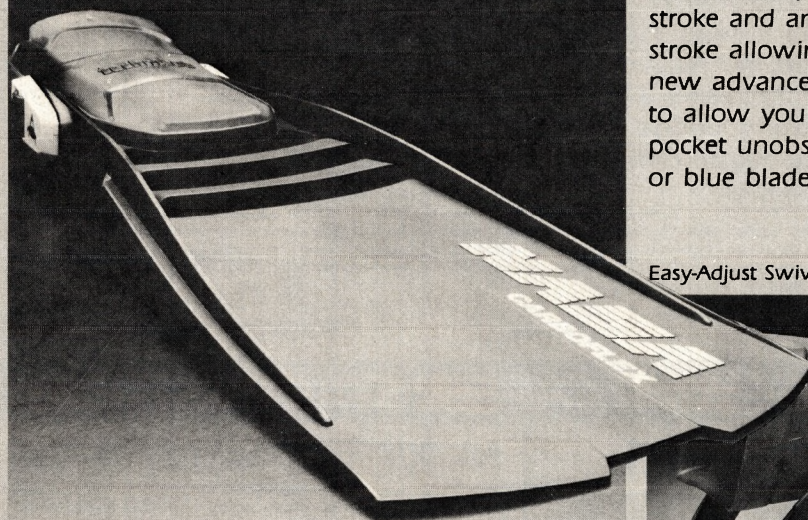


SDM's Technifacts author E.R. Cross (left) received a special award at IQ-85. NAUI president John Englander congratulates Cross, known as a pioneer in all phases of diving.

few years he developed the basic training systems that are used today in commercial diving and gained a reputation for performing some of the most unique and hair-raising commercial dives ever done. These included deep penetration dives in

powerplant intakes, difficult salvage dives and some of the first high altitude dives. Cross' high altitude diving tables, referred to as "The Cross Conversions," are still considered by many hyperbaric physicians to be the safest high altitude

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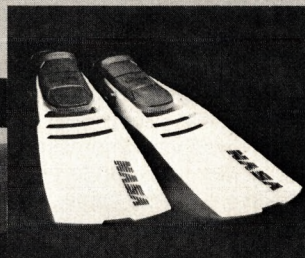


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In the mid-1950s E.R. Cross helped pioneer sport diving instruction. He was a delegate at the first two CNCA conferences, a member of the first Los Angeles County Diving Technical Advisory Committee and one of the first L.A. County diving instructors. While in the L.A. area he became a diving advisor and underwater double for the movie studios. Many people in the business believe that the Mike Nelson character, played by Lloyd Bridges in the Sea Hunt TV series, was inspired by E.R. Cross.

In late 1957 Cross boarded his 60 foot schooner *Four Winds* and sailed more than 28,000 miles to Mexico, Hawaii and the South Pacific. But this was not a simple pleasure trip. His purpose was to stop off at each area where local divers were suffering decompression problems with the "new" scuba gear, and try to educate them to minimize diving accidents. He worked with Mexican abalone divers and the Mexican Navy, spent time in the Marquesas Islands and worked with the pearl divers in the Tuamotos.

Cross ended up in Hawaii, where he became the marine construction contractor for Chevron, an association that continues today on a consulting basis. He says he decided to stop putting the helmet on when he turned 70 and now he lets the younger commercial divers get the water time. He continues to do inspection dives and to dive "just for fun."

The Ocean Corporation sponsored the idea, NAUI provided the presentation opportunity at IQ, and Bob Straight of Houston created a beautiful plaque with an exact scale replica of the Navy Mark V diving helmet. The plaque bears the following inscription: "The ocean weeds out, from all the races of mankind that come upon it to make a living, a certain type of person. This type of person stays with the ocean, and the rest are cast back ashore to deal with the land people," Dr. Wilbert Chapman.

"This award is presented by the Ocean Corporation, the National Association of Underwater Instructors and, in spirit, by the countless divers around the world who owe a debt to this certain type of person.... E.R. Cross: A pioneer ocean diver and pioneer teacher of divers, master mariner and sailor of the world's seas; ocean naturalist and conservationist; prolific writer and lecturer on sport diving, commercial diving and the sea; underwater technology consultant to the commercial diving and offshore industries; and a unique man who, in all respects, stayed with the ocean." 

XENA LITE

Two facts about Tekna's Xena Lite were incorrectly reported in the March SKIN DIVER. Actually, its case is guaranteed to a depth of 200 feet and the light sells for \$59.95. 



The Hallmark of Excellence, Worldwide

1986 marks PADI's 20th anniversary.
We share our pride with the finest instructors,
the finest dive stores and the finest divers
in the world.



We've changed the way the world learns to dive.



Photograph by Jim and Cathy Church

A fantastic variety of excellent dive sites by day. A fantastic variety of restaurants and clubs by night. For additional information, write to the United States Virgin Islands Division of Tourism, P.O. Box 471269, Miami, FL 33147.

**“...the United States Virgin Islands
have it all.”** *Jim and Cathy Church*

circle #163 on Reader Service Card

JOHNSON

30 HP Outboard

TEXT AND PHOTOGRAPHY
BY FRED FISCHER

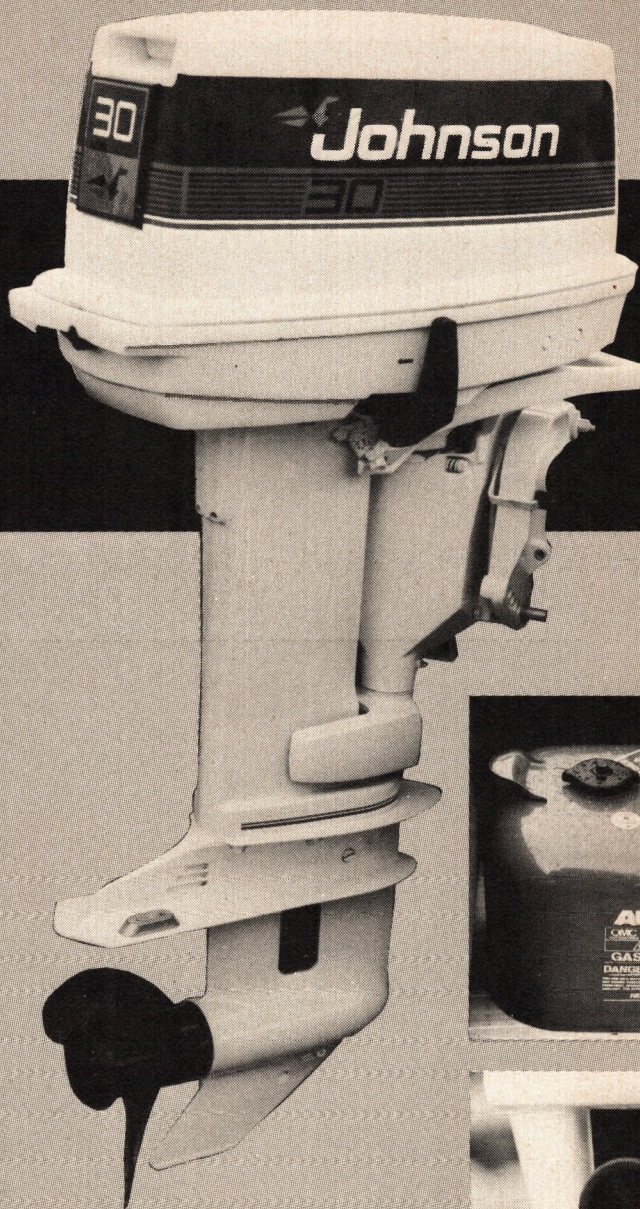
Choosing the right engine for a small dive skiff or inflatable can be difficult. You must sort through all the manufacturers' claims about paints, drive shafts and fuel injection systems. Evaluating features you cannot see is even harder. Johnson Outboards has incorporated one feature into their 30 horsepower Sea-Horse engine that is quite visible and very useful—AutoBlend oil injection.

It is a hassle to top off the gas tank of an outboard engine when you have to calculate and measure the oil that has to be added to the gas. Then the lingering doubt may persist that there is either too much or not enough oil to lubricate the cylinders and crank shaft. AutoBlend eliminates this ritual for Johnson's 9.9 to 40 horsepower (rope start) engines. You simply put gas in one opening of the fuel tank and oil into another. No measuring! A small pump automatically injects oil into the fuel line at a 100:1 ratio. No external power is required for the mixing device. It is driven by vacuum pulses from the fuel pump. Enough oil can be added to the 1.5 quart oil tank to lubricate five fills of the six gallon gas tank.

A useful feature for beach entries and exits is the Sea-Horse 30's shallow water drive bracket. By tilting the engine up and pushing on a small lever the draft is reduced by four inches. When the lever is released the engine rotates down into the normal drive position. Since no interlock mechanism is present with the gear shift, this can be done in forward, neutral or reverse. The carburetor bowl is even designed for constant fuel delivery and engine speed at any tilt angle.

A fuel injection pump is attached to the choke for cold starts. Each time the knob is pulled all the way out, atomized fuel is shot directly into the engine manifold. To warm the engine quickly and keep it warm at low rpms, a thermostat is included in the cooling line to limit water flow until it is needed when the engine is running at high speed.

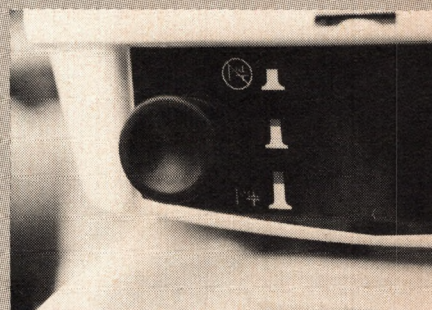
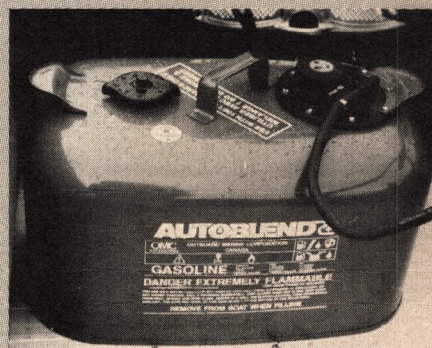
The tiller handle incorporates three



The Sea-Horse 30 features AutoBlend oil injection, which eliminates the calculation and guesswork formerly required for fuel mixing. Simply fill the fuel tank with gasoline (leaded or unleaded) and fill the oil container with oil. The injection system automatically mixes at a 100:1 gas/oil ratio. A fuel injection pump is activated when the choke handle is pulled all the way out.

controls: speed, stop and a special idle adjustment. Speed and stop operate conventionally through rotation of the grip and pushing a kill button on the end of the handle. Idle or trolling speed can be preset by turning a small knob by the stop button. This allows the operator to always come back to a preset idle speed, above that which is too low to keep the engine running steadily. It is probably more useful to fishermen than divers. The shift lever is on the side of the engine opposite the tiller handle.

There are several features not visible



on the Johnson 30 that have definite advantages. The gears that connect the drive shaft from the engine to the propeller shaft are described as spiral bevel gears. They operate more smoothly and make less noise than straight bevel gears. The crankshaft is forged out of one solid piece of metal rather than bolting together a series of rods and disks. As a result, it is stronger and can be ground more precisely for balance. Bearings in the powerhead are now made with higher precision to allow the engine to run with a 100:1 rather than 50:1 fuel to oil mixture. Electronic ignition reduces plug fouling and does not require adjustment. The piston rings are unique to Johnson. They are wedge shaped and designed to expand during the combustion cycle for a

(Continued on Page 125)

SDM BOAT REPORT

*Perfection, Speed And
Performance In A 23 Footer*



Wellcraft 230

TEXT AND PHOTOGRAPHY BY STEVE LUCAS

I'm surprised they don't build race cars or airplanes. Every time you talk to someone who sells, services, designs, tests, owns or just loves these boats the conversation somehow gets around to high performance, aerodynamics or speed. As far as the design and test engineers in Sarasota are concerned, if it doesn't go fast, or handle as if it were in a wet Grand Prix, it can't be a Wellcraft.

The same thing happened the day we went out to photograph the newly introduced Wellcraft 230 Fisherman. "We changed the prop this morning," said production engineer Lee Guilfoyle. "If you're going to quote speeds I want to change it back! We can only get 38 mph out of this one. We can get well over 40 out of the other one!" And, so it goes with everything at Wellcraft. Perfection, speed and performance are obsessions with these folks.

Class act fishing boats to mini-yachts to ultra sleek offshore racers have long been the trademark of this Florida boat manufacturer. Crafted with multi-layers of hand-laid fiberglass, the 230 is the newest addition to the Wellcraft family. With more than 100 square feet of working area around the center console, this new boat has more than enough room for six divers and all their equipment.

Just added to the fleet of the company that makes the famous Scarabs seen almost every week on the NBC hit shows Miami Vice and Riptide, the 230's deep-V



Crafted of multiple layers of hand-laid fiberglass, the Wellcraft 230 Fisherman has a deep-V hull that makes it capable of working well offshore, even in moderately rough seas. The hull forces spray out and down, keeping passengers dry. Able to handle engines up to 235 horsepower, the boat is capable of more than 40 miles per hour.

design makes it capable of working well offshore, even if the seas are moderately rough. The hull is designed to send what little spray the boat's aerodynamic superstructure creates straight out to the side and down. The result: dry and much happier passengers.

The 230 is well appointed with numerous useful accessories. It is designed to give maximum space with more than one-half dozen dry storage lockers below

WELLCRAFT 230

Length.....	22' 8"
Beam.....	8'
Construction.....	Hand-laid fiberglass
Hull.....	Deep-V
Weight.....	2,300 lbs.
Engine.....	Up to 235 hp (outboard or sea drive)
Fuel capacity.....	125 gal.
Draft.....	1' 8" (engine up)
Price:	
Base.....	\$13,695
With 2.6 liter sea drive.....	\$24,780

deck. The 230's center console is similar to that of a Scarab Sport with stainless steel grab rails, a plexiglass windscreen and an insulated cooler/seat. The cooler can be replaced with a dive tank storage rack. A hidden five drawer tackle box is also in its front for fishermen. At its base are two more storage compartments and a lockable glove box, all with smoked plexiglass hinged doors. A standard fire extinguisher box is also on the console. Lockable storage is standard for Loran and VHF electronic units.

In the aft cockpit two lockable boxes, one for the battery and the other VRO storage, are above the floor for easy access. The boxes have a teak cover and double as steps or seats. A round livewell with electric pump is standard. Seating for the skipper and first mate consists of two comfortable, swivel pedestal seats.

The bow can be arranged in several versatile plans. The forward seating pads can be removed to convert it to a roomy,

uncluttered platform for dive equipment or fishing. An optional head (marine toilet) is hidden beneath the platform and can be completely enclosed for privacy with a spray hood and curtain. Two compartments are also hidden beneath the platform and include lockable storage areas. A 65 gallon fish box with drain is also standard. The surfaces of the lockers and all walkways are non-skid to ensure safe footing.

The 230 Fisherman comes standard with some equipment normally found as options. The most obvious is the removable Bimini top. Other standard features include anchor locker; automatic bilge pump; cockpit courtesy lights; cutting board; drink holders; foam flotation; full fiberglass liner; hydraulic steering; navigation lights; and self-draining cockpit. Options include digital depth sounder; digital speedometer; compass; fire extinguisher; fiberglass bow pulpit; swim platform; trim tabs; and stereo.

At 22 feet 8 inches, the 230 Fisherman has a full 8 foot beam. Weighing 2,300 pounds empty, it has a fuel capacity of 125 gallons, which allows for a considerable amount of cruising. Power is provided by a single outboard of up to 235 hp. The boat can also be ordered in a sea drive configuration. Basic foam flotation and the Wellcraft glassed-in stringer design make the boat extremely reliable. The full fiberglass liner makes owner maintenance simple. With engine up, the 230 draws 1 foot 8 inches; with it down, 2 feet 8 inches.

Available in standard color combinations of gray with burgundy, blue or charcoal sheer, the base price, minus motor, trailer and shipping is \$13,695. With a 2.6 liter sea drive, the base price is \$24,780. For a color specifications sheet and the name of a dealer near you write: Betty L. Bauman, Marketing Communications Manager, Wellcraft Marine Corp., 8151 Bradenton Rd., Sarasota, FL 33580. 



The 230's center console arrangement allows more than 100 square feet of working area. A Bimini top is standard and the optional swim platform makes scuba entries and exits easy. The boat is available in sea drive or outboard configuration.

SDM SPECIAL SERIES ON REGULATORS



**AQUA-LUNG
PRO DIVER**

TEXT AND PHOTOGRAPHY BY ERIC HANAUER

Originally introduced in 1965, the U.S. Divers Conshelf has gained a reputation as a rugged, reliable workhorse. According to the manufacturer, it had become the best selling regulator in the United States and the rest of the world. Its simple, straightforward design offered no fancy adjustments and had no ultra-high performance specifications. But when divers needed a regulator that could deliver day after day, often without proper care, the Conshelf was a popular choice. The U.S. Navy agreed. It was one of only seven regulators to achieve the coveted high performance rating in the 1979 Experimental Diving Unit test.

But regulator design has advanced considerably since then and, if the Conshelf was to retain its ranking, some updating was necessary. By 1985 four different versions were offered: the XIV, the 20, the 30 and the SE (Special Edition). The XIV was essentially the same regulator tested in 1979. The 20 was given a Noryl plastic second stage, the 30 (now discontinued) retained the original second stage but received the upscale Royal

first stage. The SE was introduced in late 1983. It utilized the old first stage, but the ports were machined to accept U.S. Divers' new wide diameter low pressure hoses with half inch fittings. These hoses have twice the internal volume of conventional ones, maintaining intermediate pressure even at high demand. The SE also sported a brand new second stage made of Noryl, with major improvements in airflow and exhalation effort. It wasn't long before the company's engineers started playing the game of "what if?" The top-of-the-line Royal series had a high performance first stage, based on the original Conshelf design. What if that first stage was mated with the SE second stage? It was, and the result is the new Aqua-Lung Pro Diver, which not only replaces the Conshelf 30, but moves ahead of the SE both in features and in price. That makes it perhaps the ultimate development of the Conshelf theme.

The old first stage was beginning to show its age. For example, it had room for only three low pressure ports. With the propensity of today's divers to sprout all

manner of hoses, that wasn't enough. And, although internal volume was increased slightly for use with the SE, more was needed to attain the system's potential. Fortunately, a first stage was on hand

PRO DIVER

First Stage:

Type.....Balanced diaphragm
Materials....Chrome plated brass body
Weight.....N/A
High pressure ports.....One, 3/8"
Low pressure ports.....Four, 1/2"
Intermediate pressure.....145 psi
Environmental protection.....Optional

Second Stage:

Type..Lever action downstream valve
Materials....Case: Noryl thermoplastic
Diaphragm/exhaust valve: Silicone
Mouthpiece: White silicone
Weight (without hoses).....221 grams
Max. intermediate pressure.....145 psi
Hose length.....28" (octopus 39")
Warranty.....Lifetime, includes parts
Price.....\$299

that could meet those demands: the one used on the Royal series. It makes sense to use it with the Pro Diver, because it, too, is based on Conshelf technology. Retaining the balanced diaphragm design, which has become the U.S. Divers standard, the Royal first stage offers a huge air reservoir along with four low pressure ports.

The Pro Diver first stage is a heavy brass casting, chrome plated, in a shape reminiscent of an Apollo space capsule. When first introduced with the Royal series, it had a dull but high-tech looking brushed steel finish. However, the coating proved to be too thin and divers seemed to prefer a shiny look. Its one high pressure and four low pressure ports are spaced evenly around the perimeter to provide easy adjustment for individual needs. The angle of the mounting surface is designed for minimal bending of the hoses, which should extend their useful life. But the major advantage of this first stage over that of the Conshelf is its larger air reservoir. Combined with the wider diameter hoses, the system can maintain its intermediate pressure of 145 psi under the most extreme air demands.

Since the wide, low pressure hoses require a half inch fitting, adapters are included with every regulator. This allows the diver to fit any type of octopus, BC or drysuit inflator to his/her first stage. A protector is included as standard equipment on the regulator hose. Up until now, U.S. Divers had discouraged the use of protectors on their hoses because they trap water, leading to deterioration of the hose and its fitting. This new protector has a unique drainage system to overcome the problem. Unfortunately, it was not available at the time of our test.

As is the case with all U.S. Divers regulators, an environmental kit is available as an extra cost option. Known as the Pro Diver Supreme, it consists of an additional silicone-filled chamber that prevents icy or polluted water from coming in contact with the first stage diaphragm.

The Pro Diver's second stage is a refined version of the one introduced last year on the Conshelf SE. Utilizing the proven downstream lever action design, Aqua-Lung engineers focused their attention on the interior shape of the case. Airflow is adversely affected by sharp corners, thus every flat edge within this housing is rounded off, reducing turbulence and resistance. A new exhaust tee was developed, with a swept-back shape to deflect bubbles away from the mask lens. It rests on the diver's chin in such a way as to maintain the upward angle and decrease exhalation effort. For 1986, the edges of the exhalation port were rounded



ed off, as well as those of the three valve supports. The result is a 15 percent decrease in exhalation effort over the Conshelf SE.

This rounded, low turbulence molding is possible only with a thermoplastic material and is one of the reasons so many manufacturers use it today. Noryl is an extremely tough material, stronger and lighter than brass. The Chicago Bears' Refrigerator could step on this second stage with no ill effects. It can't corrode in saltwater and its lower cost keeps the accounting department happy. Photographers appreciate its good looks and the fact it doesn't produce glare when hit by a strobe light. The screw-on cover is available in black, yellow or blue to match a model's color scheme. And, with no need of a retaining ring, it is easily removed when servicing is necessary.

Annual inspection and servicing by an authorized USD repair center will keep the new Cousteau guarantee in force. Under its terms, the original owner will never have to pay for parts. He pays only for labor, which presently runs about \$27 for a complete overhaul. If only inspection and adjustment are needed, the cost is considerably less.

On our test dives, the Pro Diver proved to be a calm, easy performer with no unpleasant surprises. It breathes smoothly, with a natural feel, owing to its low cracking effort. This is especially evident when just sipping air. Although its airflow is not up to the standard of the Royal SL, there was no feeling of air shortage even when swimming hard at a depth of 100 feet. Only when tank pressure drops below

500 pounds is there a detectable increase in inhalation effort.

The changes in the exhaust tee and valve support were responsible for the ease of exhalation, adding to the general feeling of comfort this regulator provides. It will freeflow when removed from the mouth after a hard exhalation with the mouthpiece up, but the flow usually stops by itself. If not, just turn the mouthpiece down. The freeflow is not nearly as strong as that of the ultra-high performance genre of regulators.

Clearing is very easy owing to the efficient exhaust system. The purge button, because of its limited travel, blows only a gentle zephyr rather than a hard blast. But that's more than enough. Any more would be overkill.

The Pro Diver is generally a dry breathing regulator. It leaked slightly only when I was on my back, looking up. It also breathed harder in that position. On descent, a slight freeflow kept the water out.

This regulator combines the no-nonsense reliability of an improved Conshelf second stage with the high airflow characteristics of the Royal first stage. Whether one considers it the ultimate Conshelf or a bridge between the Conshelf and the Royal series, the Pro Diver will appeal to the advanced sport diver who wants a good performing, low maintenance regulator. With the Cousteau guarantee, the list price is \$299. The Supreme version, with environmental kit, is \$30 more. Try the Pro Diver at your local U.S. Divers dealer or, for further information, contact USD Corporation, 3323 W. Warner, Santa Ana, CA 92799-5018.

SDM's U/W Photo Class

All About Lenses

TEXT AND PHOTOGRAPHY BY JIM AND CATHY CHURCH

The key to using lenses effectively is simple: The picture area of the lens must fit the subject. Otherwise, you're just beating your head on the coral.

LENSES FOR LARGE SUBJECTS

For sharp, colorful pictures of large subjects, use wide angle lenses that allow you to get close. If you use a normal angle lens, camera to subject distance will be too great—you lose color, contrast and detail. This is why scenic, long-distance shots taken with 35mm lenses—even in gin-clear water—usually fall flat! The exception is the upward silhouette, where colors and fine details don't matter. The key idea is: For large subjects, use lenses with focal lengths of 24, 20, 17, 15mm or shorter.

A 24 or 20mm lens is good for diver portraits. Focus in to 1.5 feet for the head and shoulders, or focus at three to five feet for the entire diver. Just be careful that arms or fins don't extend toward the lens or these parts will appear larger than normal in the picture. The wider the lens, the greater this distortion of near subject areas. For wreck photography, a 24 or 20mm lens may fit specific pieces of wreckage such as an anchor or windlass.

A 15 or 17mm lens is great for wide angle photography of shipwrecks, U/W archways, terrain and groups of divers. When working with big subjects, move in and fill the viewfinder with subject and you can't go wrong. However, a 15mm lens is sometimes too wide. You may see fins dangling in the tops, or arms or heads at the sides of your pictures—all parts of divers that weren't supposed to be in the pictures. If you have this problem, get closer and scan the edges and corners in the viewfinder.

With housed cameras, wide angle lenses from about 24mm to fisheye can be used. But, before buying a wide angle lens, contact the housing manufacturer; ask if the port you have (or can get) is the correct port for that lens. Otherwise, the loss of corner sharpness in your pictures will be disappointing.

LENSES FOR MEDIUM-SIZED SUBJECTS

Use a 35 or standard 50mm lens for head and shoulder diver portraits, large anemones, fish or small groups of fish. Be careful to set the focus accurately be-

cause depth of field is limited—especially at close distances. Blurry pictures can be a problem with a 35mm lens when you must estimate distance by eye.

Subject size is another problem because many U/W photographers prefer subjects that are too large or too small for a 35mm or standard 50mm lens. Avoid larger subjects—such as entire divers or groups of divers—because you must back off too far from your subjects. Resist the temptation to photograph tiny subjects two feet in front of the camera. If you can reach out and touch the subject, you're too close for proper focus.

The 28mm lens is better for medium-sized subjects because it is slightly wider than the 35mm lens and is optically sharper. With the focus set for two feet, it is great for photographing large fish, turtles, eels and other sea life. At longer distances, it is ideal for larger animals such as sharks, dolphins or rays that you can't get close to.

LENSES FOR THE SMALL STUFF

Close-up photography is easy and exciting. It's easy because subjects are often easier to find, turbid water is less of a problem at close distances, exposures are more predictable and strobe lighting brings out brilliant colors.

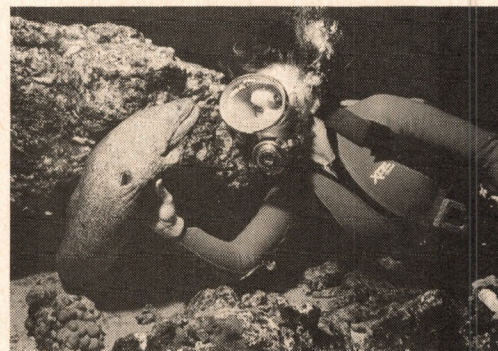
With a housed camera, close-focusing (micro or macro) lenses are best. Most U/W photographers prefer 50 or 55mm close-focusing lenses that focus from infinity down to about a 2 x 3 inch picture area only a few inches in front of the camera. For photographing creatures that are hard to approach, 100 and 200mm close-focusing lenses can be used. However, these longer lenses are harder to focus through your SLR viewfinder and require special lens ports or extensions.

If you have a standard 50mm lens that only focuses down to about three feet, you can screw a standard close-up lens over the camera lens for close-ups. You will be locked in at one basic distance and picture area, but you can take some exciting close-ups.

The 35 or 28mm lens of a Nikonos or other amphibious camera can also be used for close-ups. All you need is a close-up lens that fits in front of the regular camera lens. The close-up lens allows you to photograph picture areas of about 3 x 4 inches to about 12 x 18 inches.



Large subjects need wide angle lenses.



Diver/eel photo taken with a 20mm lens.



Pufferfish's face—1:3 extension tube.

LENS SPECIFICATIONS

Type	Focal Length	Aperture Range	Minimum Focus (in.)	U/W Picture Angle (diag.)
Nikonos	15mm	f/2.8-22	11.8	94 degrees
Sea & Sea	17mm	f/3.5-22	13.7	86 degrees
Nikonos	20mm	f/2.8-22	15.6	78 degrees
Nikonos	28mm	f/3.5-22	23.6	59 degrees
Nikonos	35mm	f/2.5-22	31.5	46 degrees
*Nikon	55mm	f/3.5-32	9.5	32 degrees
*Nikon	105mm	f/4-32	18.5	16 degrees
*Nikon	200mm	f/4-32	27.5	9 degrees

*Close-focusing lenses for housed Nikon 35mm SLR and flat housing port.

EVALUATING LENSES

There are five standards to use when evaluating a camera lens for underwater photography: focal length, aperture range, minimum focus, quality and available accessories.

Focal Length (the number associated with the lens, such as 15mm) indicates the angle of view the lens sees, thus the size of the picture area. The shorter the focal length (such as 15mm as compared to 35mm), the greater the picture area photographed at any particular distance and the greater the depth of field.

Aperture Range—from the lowest-numbered to the highest-numbered stops—indicates how well the lens can handle extreme dim and bright lighting. The lower the f number at the bottom of the range (f/2.5) the wider the lens can be opened to take exposures in dim light. The higher the f number at the top of the range (f/22), the more the lens can be closed to take exposures in bright light.

Minimum Focus (distance setting) is how close you can get to your U/W subjects. Simple cameras may be pre-focused for a single distance, or may have distance settings for either near or far. More sophisticated cameras usually can be set for any distance from infinity to as close as two or three feet. For housed 35mm SLR cameras, special close-focusing lenses (also called micro or macro lenses) can be focused as close as a few inches.

Lens Quality is a tricky subject. For small color prints in a scrapbook, or for a living room slide show, differences in lens quality between expensive and inexpensive lenses and/or lens accessories may not be noticed. But for 16 x 20 inch color prints or large-screen projection, differences in lens quality become apparent. Generally speaking: (1) Quality and price are related. (2) A wide angle lens is better than a normal lens with a supplementary wide angle adapter. (3) A close-focusing lens is better than a regular lens with a supplementary close-up lens attached.

Lens Accessories include supplementary close-up lenses, extension tubes, wide angle adapters and filters. While you may not use lens accessories with wide angle and close-focusing lenses, these accessories increase the versatility of 35 and 28mm lenses.



Here a wide angle lens captures the encrusted deck of a ship in Truk Lagoon.

And, with a Nikonos, extension tubes can be placed between the camera body and lens so you can photograph even smaller picture areas.

CONCLUSIONS

This lesson has been an overview of lenses. Subsequent lessons will concentrate on specific areas, such as how to take wide angle or close-up pictures and

how to use strobe lighting.

FOR MORE INFORMATION

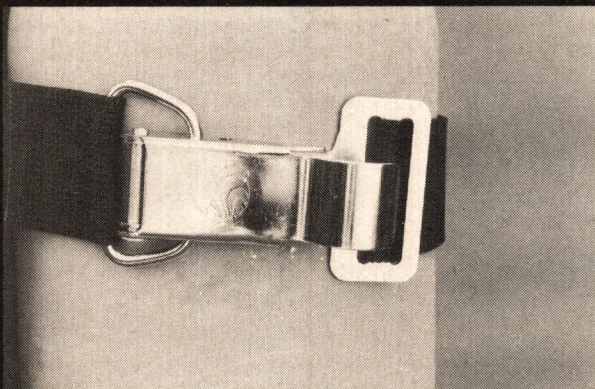
For prices and details about lenses, write directly to these companies: Akimbo, Inc., 4437 Balboa Ave., Encino, CA 91316—Subawider II wide angle adapter for Nikonos 35mm lens. Ikelite, P.O. Box 88100, Indianapolis, IN 46208— housings and dome ports for wide angle lenses.

Send \$1 for catalog. Nikon Inc., 623 Stewart Ave., Garden City, NY 11530— Ask for Lit/Pac #58. Oceanic USA, 14275 Catalina St., San Leandro, CA 94577—housing and ports for Nikon and Canon cameras. Send \$2.50 for catalog. U.S.A., 1030 W. 15th St., Riviera Beach, FL 33404—Motormarine camera with 24mm wide angle adapter and close-up lens. 

THE SEASPORT BLADDER FREE BC

Rugged and Reliable

BY JIM WALKER



photos/Bonnie J. Cardone

When most manufacturers of buoyancy compensators are leaning toward the philosophy of "more is better," Seasport Incorporated has taken the opposite approach. While still offering all the necessary and convenient features divers have come to depend on, the JM-625 Bladder Free Jacket makes a very strong case for simplicity.

The JM-625 is, as its name implies, bladderless. However, this minus is actually a plus. As the Seasport literature indicates: "Why bladder free?—Why tubeless tires?" The idea is that BCs, just like auto tires, can be punctured and leak resistant without the hassle of an inner tube or bladder. The single bag design also makes rinsing the inside quick and easy.

The jacket material of the JM-625 is an ultra-tough combination and easy to clean. It starts with a unique Antron cross weave of 800 denier Cordura nylon. The cross weave is what gives the material its sheen. This material actually has to be made in special runs for Seasport. The Cordura is then thermally bonded to multiple layers of polyurethane. The combination is rated for a puncture resistance of 600 pounds per square inch and can withstand the effects of ultraviolet light, ozone, salt, oil and aging. Each run of fabric is tested at Seasport. The material is so sturdy, it actually has what I'd de-

Seasport's JM-625 BC is made of ultra-tough Cordura/polyurethane, which eliminates the need for an inner bladder. It comes with a combination low pressure/manual inflator and backpack. The tank band is nylon webbing, which is collapsible and, thus, takes up less room in a gear bag. The band closes with a stainless steel buckle. Grommets at the base of the jacket serve as sites for attaching clip-on gear.

scribe as a "crisp" feel. The edges of the bag are thermally welded and have sewn-on tape. The bag, as well as the rest of the JM-625 is warranted for two years on material and workmanship.

The JM-625 is designed to fit closely, yet comfortably, resulting in a low drag profile underwater. Velcro® closing guides on both shoulders keep hoses neatly in place and Velcro closing pocket covers streamline the expandable, mesh backed pockets. The right-hand pocket flap is sewn only partially across the top. Thus, the diver can carry an extra second stage in the pocket without contorting its hose. This pocket covers the stubbed CO₂ attachment. The optional inflator mechanism is available for \$5 or the jacket can be ordered with it (model JM-650). The left pocket covers the overpressure relief valve.

A chest strap with a snap-in buckle and a nylon webbing waistband with snap-over buckle secure the BC comfortably. (Newer models will have a padded cummerbund waistband.)

The JM-625 comes complete with a manual/power inflator/deflator mechanism and low pressure hose. Just a light pull on the mechanism opens a valve on the left shoulder and vents the BC. A plastic backpack is included. It is contoured to fit the diver's back, has a carrying handle and comes with a nylon webbing tank band that closes with a stainless steel snap-over buckle. A rubber sheath on the band and a curved rubber backing on the pack prevent tank slippage. The flexible tank band takes up less room in a gear bag.

Two grommets built into the lower edge of the jacket (one on either side) serve as sites of attachment for clip-on goodie bags, etc.

The JM-625 Bladder Free BC comes in orange with black trim, black with red trim and royal blue with black trim. It is available in five sizes (XS through XL) with positive buoyancy ratings of 25-65 pounds. The retail price is about \$350. See one at your Seasport dealer or, for information, contact Seasport Inc., P.O. Box 7149, Ventura CA 93006; phone (805) 658-7174. 

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With the Merc 50 and 60, you'll never have to mix and measure oil. The Mercury oil injection system mixes oil and gas at one location, ahead of the fuel pump, for a thorough blend, fewer moving parts and no complicated electrical connections. It also outdistances competitive systems with a 3-quart tank that treats 36 gallons of gas.

Both models feature a 3-cylinder design that runs smoother and accelerates better than twin cylinder engines. The three cylinders also get better performance out of pulse-tuning, a technique that works like racing exhaust systems to boost power and fuel efficiency.

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Each year, each Mercury gets better. They're evaluated in the laboratory. In punishing tests. In real world applications. And in customer satisfaction.

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Dealer Inquiries Invited

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U.S. DIVERS MARKETING COORDINATOR

U.S. Divers recently named Andrea Garcia marketing coordinator for Aqua-Lung products. Based at U.S. Divers headquarters in Santa Ana, California, Garcia reports to Larry Chisholm, USD national sales manager.



In her new position, Garcia is responsible for product forecasting based on dealer input and market trends. She also handles marketing administration activities, including advertising, public relations and the company's participation in trade shows.

NAUI COLLEGE

Fourth quarter figures for the National Association of Underwater Instructors College show another large increase in student registrations (124 percent) over the comparable period in 1984.

The college is in its eighth year, offering a complete curriculum of advanced diver and instructor training courses.

In an effort to increase its value to the diving business community, it has stepped up its service to inform all potential employers and career candidates regarding job opportunities. To assist diving operators looking for quality instructors, divemasters and management candidates, the placement assistance office immediately posts all job order inquiries for interested students and enters them in its files. Phone numbers and resumes of registered alumni looking for opportunities are sent to employers upon request.

The college has spent three years computer cataloging information on potential employers. Further, full-service personalized counseling regarding career goals, resume preparation and interview techniques is given to all students at no charge.

A REMINDER —Ad closing date for Skin Diver's Florida Keys Special Section in the July Issue is April 15th. Don't miss it!

SDM travel SECTION

The world's most popular dive destinations share certain basic similarities. They are blessed with warm, clear waters populated by vibrant and flourishing reef populations. The seascape is likely to be diverse, featuring shallow reefs, medium and deep dives, a vertical wall and even a wreck or two. There should be easy access, preferably with a jetport served by several airlines with daily departures and arrivals. Ideally, there will be a variety of hotels and they should have an interest in working with a responsible dive operation that will provide safe, reliable reef tours, scuba instruction, equipment rentals and a retail facility. The formula for this model vacation paradise would include a wealth of recreational activities other than diving to balance the time spent in water. Shopping, night life, fine dining, golf, tennis, sport fishing, windsurfing and other watersports add to the overall appeal, especially to the non-diving companion. This combination of elements exists in only a very few spots in the world and Freeport, Grand Bahama Island, is one of them.

Grand Bahama is in the Western Atlantic Ocean, just 60 miles to the east of Palm Beach, Florida. This close proximity to the United States, combined with the desirability of Freeport as a vacation destination, has made it one of the most accessible islands in the world. During our recent tour we flew Gull Air from Miami. There are also direct flights from many major U.S. cities and areas of the Caribbean on Bahamasair, Eastern, Pan Am, United, Ozark, Trans Air, Caribbean Express and private charter.

The warm, clear waters of the Gulf Stream are responsible for the generally very good, and often remarkable, underwater visibility. The coral reef



FUNTASTIC FREEPORT Home of Diving's Dynamic Duo

TEXT AND PHOTOGRAPHY
BY STEPHEN FRINK

configurations include a shallow reef typified by forests of elkhorn and staghorn corals interspersed with brain, pillar and star corals and adorned with multi-hued gorgonia and seafans of both yellow and purple.

The mid-reef is found in 30 to 60 feet of water and is populated by a wider range of reef and pelagic fish. The corals are generally high profile with a spur and groove configuration.

The deep dive of the day can offer a wall dive, although the wall starts in 80 to 110 feet of water in this area and necessitates a relatively short bottom time or a decompression dive. More likely, the deep dive will include a fas-

Freeport possesses the perfect formula for a model dive vacation, including a wealth of recreational activities. Above: The Holiday Inn and beach. Below: Barbara Doernbach and hogfish.



inating reef tour in 60 to 90 feet of water, or perhaps Theo's Wreck, a 230 foot steel freighter perched on the edge of the ledge in 100 feet of water. For divers wishing to experience something a little different, Freeport also boasts an extensive system of caverns, underwater caves and blue

travel

holes. While not all of these are open to diving at this time, others such as Mermaid's Lair are available and particularly captivating.

For more than 21 years, diving tourists visiting the underwater attractions of Freeport have been professionally served by the Underwater Explorers Society, UNEXSO. In Freeport's fastest developing area, UNEXSO is possibly the most complete diving center in the world. There are two swimming pools used for scuba instruction and recreation, with the 18 foot deep tank especially functional for resort courses and checkouts. UNEXSO is very dedicated to scuba instruction and continuing diver education. To that end, there is ample classroom space and staff to conduct a variety of courses, including more than 175 open water certifications and, incredibly, more than 2,500 NAUI entry scuba experiences (resort courses) annually. Other advanced instructional offerings include cave and cavern diving, decompression diving and an especially popular marine identification course conducted by longtime UNEXSO staff member Ben Rose.

UNEXSO operates three modern and efficient deep-V dive boats for its three per day reef excursions: The *Explorer I* is a new 40 foot fiberglass vessel that can accommodate 24 divers and make 18 knots. The *Biene* is a 42 foot deep-V for 18 divers and the *Rio Rita* is a 27 footer set up to accommodate 12 divers. All of these boats are powered by reliable diesel engines and are equipped for maximum diver convenience with tank racks, dive platforms, open deck areas for sunning and a sheltered section for protection from sun and spray. The scuba gear rental facility is at dockside, as well as the two 22 cfm compressors and air storage system. Other UNEXSO amenities include E-6 film processing; underwater video; one of the Bahamas' most complete dive retail centers, featuring not only dive equipment, but resort fashions, T-shirts, postcards, posters, books and underwater photo gear. UNEXSO also maintains the Bahamas' only recompression chamber on premises for both diver safety and instruction.



Above: U/W video. Right, top to bottom: Horse-eye jacks, Theo's Wreck. UNEXSO's John Englander (left), Susan Turnquest and Barry Taylor. Explorer I.



For several years the Holiday Inn and UNEXSO have collaborated to provide dive/lodging packages structured for both diver convenience and savings. The Freeport Holiday Inn features a magnificent setting, directly on a beautiful sand beach just a short walk from UNEXSO. There are 505 double rooms; three restaurants, both formal and informal; three lounges, including the Panache disco, which is one of Freeport's hottest night spots; tennis courts; a freshwater swimming pool; men's and women's saunas; a health studio; game room; beauty salon; a shopping arcade; color television and telephones in each room; and, of course, the services one would expect from a quality resort hotel such as room service, laundry, porters, etc.

The hub of daytime activities for the Holiday Inn is at beach and poolside, for there are more watersports activities offered here than are available anywhere else in Freeport. The wide sand beach is especially suitable for traditional activities such as sunbaking, swimming, or just lounging about, and there are more exhilarating pursuits such as parasailing, snorkeling, fishing trips or water skiing. Nighttime activities at the Holiday Inn are centered around the gourmet dining at the Troubadour restaurant, or perhaps special island theme nights with an outdoor buffet at poolside and live entertainment such as a steel band, fire eaters, magicians or even a junkanoo procession. The Holiday Inn contends that there is more to a dive vacation



than just diving and offers a variety of pleasurable options. The newly renovated Lucayan Beach Hotel directly across the road from UNEXSO is but a five minute walk from the Holiday Inn and features a full casino and cabaret show. Virtually all of the entertainment options that have established Freeport as a major vacation destination are within minutes of the Holiday Inn.

The Holiday Inn/UNEXSO dive package includes accommodations and the unlimited diving program, but does not necessarily include meals. With the diversity of fine restaurants throughout Freeport, it is preferable not to be locked into a meal package, but rather to explore. For further information or reservations, please phone toll free (800) HOLIDAY and ask about the Dive Grand Bahama package. To contact UNEXSO directly, phone (809) 373-1244 or write to P.O. Box F2433, Freeport, Grand Bahama.

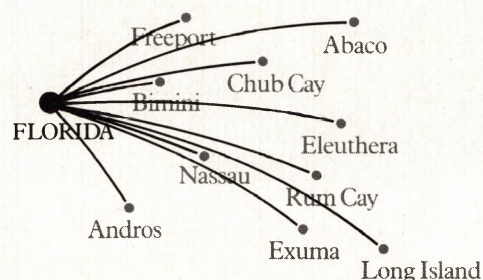
The Bahamas.

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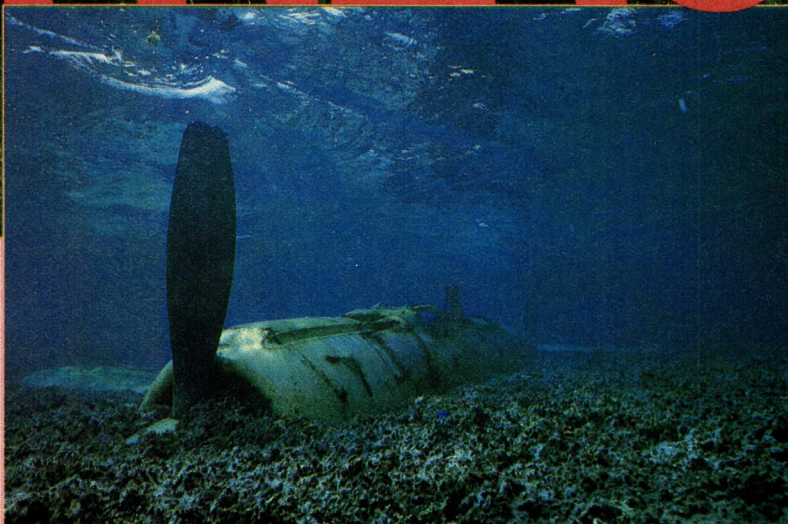
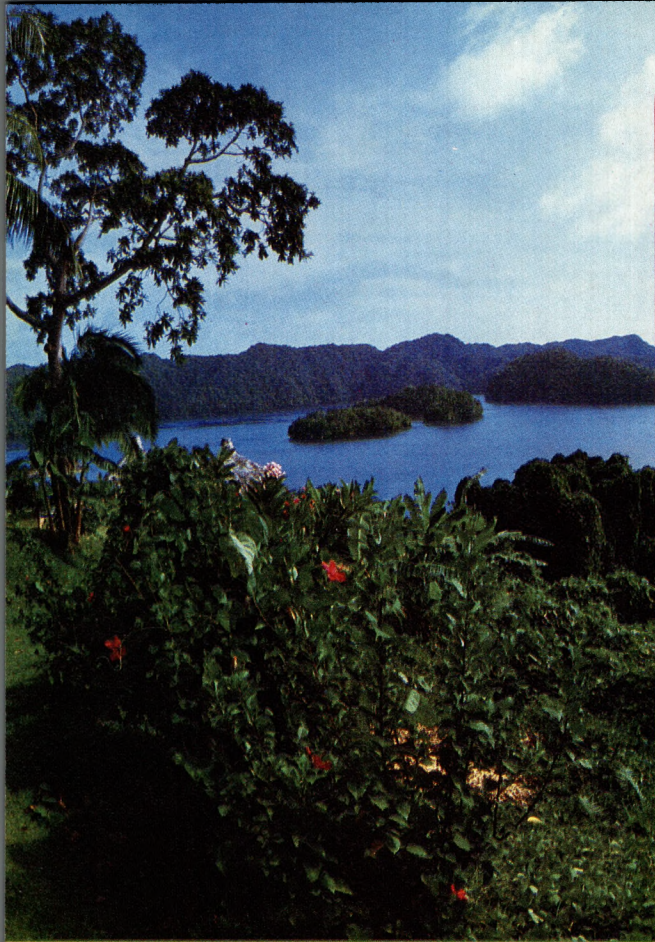


For sports information, call 800-32-SPORT toll free. For hotel reservations, see your Travel Agent or call 800-327-0787. In Dade County, 443-3821.

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It's Better In The Bahamas.

PALAU



Palau (officially the Republic of Belau) consists of five main islands and 300 uninhabited smaller ones called "rock islands." The diving includes walls, reefs and wrecks. Top: Rock islands of Ngrikuul Bay. Above: A Japanese Zero fighter plane in shallow water off Urukthapel Island. Left: Palau Pacific Resort. Lower left: PPR room. Below: A Palau sunset.



Do you have varied interests in diving? Do you want wall dives? Well, consider sheer vertical drop-offs starting at two feet and descending to 800. Do you want new sites? Try 250 miles of unexplored barrier reefs. Do you like wreck dives? Dive the remains of a World War II battle where 38 ships and 150 aircraft

were destroyed. Hoping for the unusual? Try beds of giant *Tridacna* clams, cavern ceilings lined with stalactites and inland lakes with millions of jellyfish. All of this, and more, is available in a cluster of islands 125 miles long and 35 miles wide known as Palau.

The westernmost island group in the Micronesian chain, Palau is 550 miles due east of the Philippines. It consists of five main islands and over 300 uninhabited smaller ones. These green, mushroom shaped clusters, undercut by coral eating chitons, are referred to as the "rock islands."

Near the equator, Palau's temperature and humidity range in the 80s, so lightweight is the accepted garb. Its 156 inches of annual rainfall usually occurs May through November. Formerly part of the Trust Territory of the Pacific Islands (a postwar mandate to the United States), the islands have successfully petitioned for their independence and are now designated the Republic of Belau. English is the second language and U.S. currency the norm.

Flights to Palau's main airport on Babelthap run four times weekly from Guam on Continental/Air Micronesia's 727s. After clearing immigrations, where proof of U.S. citizenship is required, it is a 45 minute drive to the hotels via the capital city of Koror.

Visitors have two choices for accommodations. Opened in December, the ultra-plush Palau Pacific Resort has 100 air-conditioned rooms spread over a 64 acre, two-tiered complex. Beautiful sunsets may be viewed from the rooms' lanais and each room has its own refrigerator and mini-bar (stocked daily). Guests may enjoy the freshwater swimming pool, large manmade, white sand beach, duty-free shop, hair salon, two restaurants and bars. Managed by Kunio Mitsutsune, the accommodations are top notch and designed for the active and laid-back vacationer.

Hotel Nikko Palau is a terraced complex with a breathtaking view of the rock islands in Ngrikuul Bay. The hotel has a bar, gift shop, restaurant and 51 air-con-

ditioned rooms, each with a balcony and refrigerator. Opened as the Palau Continental 16 years ago, it is now managed by Kaoru Kikushima.

"No problem" is the reply from Francis Toribiong, the owner of Fish-N-Fins dive shop in Koror. A native of Palau, he was educated in the United States and is a ten

year NAUI instructor. No problem seems too great or small for Francis and his staff. "There is diving here for everybody. Whatever the groups want and we feel they can safely handle—no problem." With 100 80 cubic foot aluminum tanks, he can accommodate 40 divers daily. His staff is well versed on the waters off Palau and they are equipped with dive computers for safety.

Fish-N-Fins has a fleet of five dive boats that can handle 1-4, 4-6 and 6-10 divers. This allows flexibility of group size, background and requests. Francis has the monumental task of making everyone happy—no problem.

The uncovered boats are fast (45 minutes to one hour to sites) but 1-2 foot sea chop can be bumpy. Sunscreen, sunglasses and hats are recommended. With their gear, divers should also bring lights, batteries and film. No developing services are available on the island. Electricity is 110 volt, 60 cycle so charging lights and strobes is easy. A recompression facility is at McDonald Memorial Hospital in Koror. Diving charter services for Fish-N-Fins may be made with Art Travers at Poseidon Ventures Tours.

Take walls that start at ten feet and drop to 800 or more; a slight current for great visibility (80-120 feet plus); warm water (84-88°F); over 300 different species of coral; a wide variety of tropicals and a plentiful supply of large and exciting pelagics. Mix them all together to get the *average* dive offerings at Palau. The names and profiles may vary between sites, but the diving is the same—pristine, heart-pounding and awesome. Names like Ngemelis Drop-Off, Blue Corner and Peleliu Tip are outstanding, steep drop-offs that seemingly have no bottom. Entrances to the walls of Blue Hole and Turtle Cove are through a large circular cut on top of the reef that deposits divers 50 to 130 feet below. Lined with black coral, these entryways to underwater Edens must be experienced.

Siaes Cave starts at five feet. A descent to 90 feet brings divers to a huge, well lit cavern entrance. Continuing to 130 feet, divers pass through black coral

trees and giant gorgonian fans. White tipped reef sharks are sometimes seen here. A look outside may treat viewers to schools of barracuda, gray reef sharks and an occasional turtle.

Short Drop-Off is a 30 minute boat hop from Koror. It is an excellent and prolific wall for night dives with ample opportunities for photographs.

Historical wrecks are also a part of Palau's dive profile. With over 30,000 men as occupational forces during World War II, and its link in Japan's oil supply line from the Indies, Palau was one of the Empire's valuable strongholds. Its strategic importance increased after the loss of Truk in February of 1944.

The Allied forces continued their sweep across the Pacific. In March, Admiral Spruance's Task Force 58 staged a major assault on Palau. For two days the islands were pounded by naval bombardment and waves of air attacks. Losses to the Japanese were devastating: thousands were killed, 150 aircraft destroyed and 38 ships sunk.

Caught at anchorage, the *Iro Maru* now lies upright in 140 feet of water. The 14,050 ton Shiretoko class fleet tanker is mysterious and beautiful. Her masts rise to 35 feet and at 80 feet open cargo holds beckon the adventurous. The ship is covered with corals, anemones and barnacles. A small school of batfish escorts divers around the deck guns on its bow and stern. Visibility can range from a disappointing 10 feet to an exciting 90 feet. Fish-N-Fins runs excursions to the *Iro Maru* and seven other wrecks.

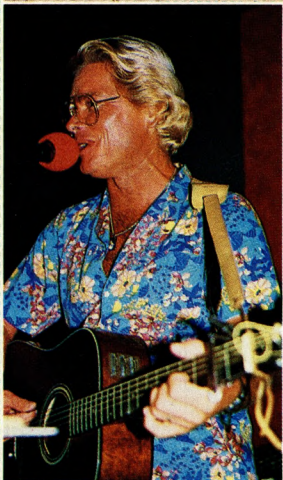
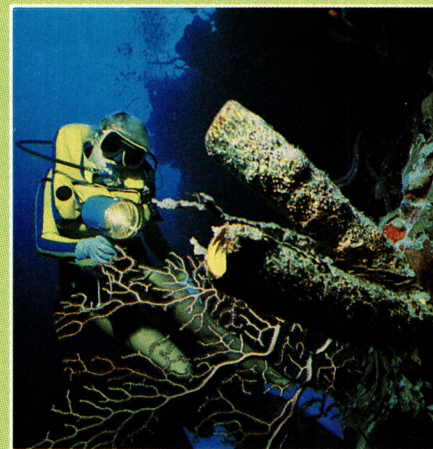
On the other side of Urukthapel lies the remarkably well preserved wreckage of a zero aircraft in five feet of water. An easy snorkel dive at high tide, its aluminum fuselage and tail remain unblemished. The cockpit's canopy is missing, presumably lost during the plane's ditching. Visitors can easily slip into the pilot's seat. Though it is stripped of its 7.7mm machine guns and instruments, you can still feel the size of this famed fighter. The top of its three bladed propeller stands upright and points seaward, a mute testament to the courage and sadness of a bloodier era.

There are four unparalleled exploits divers should not miss on Palau. Snorkelers wearing protective footwear leave their boat at the shore for a 200 yard hike over a steep hill to Jellyfish Lake, on the east side of Eil Malk Island. After a short swim through a mangrove-lined channel, they are bathed in clear, warm (86-90°F) water. The lake teems with countless, gold-bodied medusae and transparent moon jellyfish. These non-stinging ctenophores derive their food from a photosynthetic algae living symbiotically in their tissues. Seeking out the sun, they migrate across the lake, their undulating,

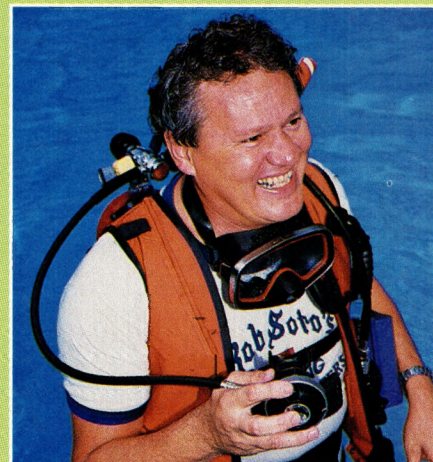
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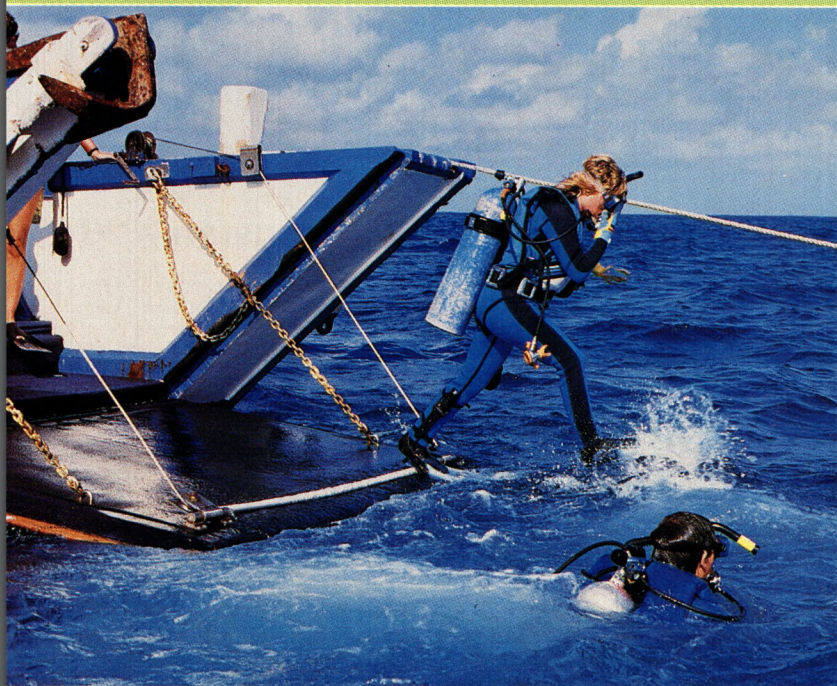
Showcase For Exotic Diving

TEXT AND PHOTOGRAPHY BY ROD AND KATHY CANHAM



Clockwise from above: Divers board the *Holiday Diver* directly from the beach. A diver photographs a seafan at Sand Chute. Ron Kipp, owner of Bob Soto's Diving Ltd. The Holiday Inn rooms—right on the beach. Sailboats and watersport gear on the Holiday Inn beach. Barefoot Man performs.





Above: Bob Soto's drop-front dive boats make scuba entries convenient. Left: Cayman Airways jet. Right: Aqua Delights is the largest watersport operation in the Cayman Islands and offers sailing, windsurfing, inflatables, parasailing and more.



One of the comfortable Holiday Inn rooms.



Jim Brown and daughter Tishan of Aqua Delights.



GRAND CAYMAN

Shining Star Of Seven Mile Beach

TEXT AND PHOTOGRAPHY
BY GERRI MURPHY

Whether you're a first time visitor or a life-long resident, everyone on Grand Cayman knows the Holiday Inn. Since the beginning of Cayman tourism, this beachfront hotel has been synonymous with the charm and success of the island. Through the years it has served as the island's meeting ground for business conferences; as the social center for evening entertainment; and, of course, as the most popular resort for visiting divers.

This particular Holiday Inn is different from most as it offers a distinctive combination of facilities and activities unobtainable anywhere else. In the center of Seven Mile Beach, this resort offers the best watersport center, the finest beach, the largest dive center and the most exciting nightclub on Grand Cayman.

The most compelling attraction of the Holiday Inn is its location: It is on the beach. The two main buildings are barely

50 to 100 feet from the water's edge. Guests can step out of their rooms directly onto one of the finest beaches in the entire Caribbean. Oceanside rooms provide a panoramic view of a tropical sea and some of the most spectacular sunsets in this part of the world.

Seven Mile Beach—and the Holiday Inn—are on the west side of Grand Cayman. This is the lee side of the island, completely protected from trade winds and strong currents. The ocean's surface is almost always flat and the water is crystal clear. Water temperatures range from 80 to 82°F and offer what has been described often as "bathtub diving."

Directly off Seven Mile Beach is a magnificent drop-off running parallel to shore. Grand Cayman's most popular dive sites are found here including such legendary spots as Trinity Caves, Big Tunnel and Orange Canyon. Straight out from the ho-

tel is the wreck of the famous *Oro Verde*, a fully intact steel freighter in 50 feet of water. All of this marvelous diving is only a 5 to 10 minute ride from the hotel. Dive boats pull right up on the Holiday Inn beach and board hotel guests. Divers barely have time to get their dive gear out of the bag before the boat is tying up to the dive site mooring.

The Holiday Inn itself has many distinctions. It is the largest and most luxurious hotel actually on Seven Mile Beach. Of its more than 215 rooms, nearly 100 face the beach. All are fully air-conditioned with AC units that can be individually controlled. The Holiday Inn is one of the few hotels on the island that has telephones in every room and international direct dialing to the U.S.

The Holiday Inn is a full vacation resort that offers just about every service and

(Continued on Page 80)



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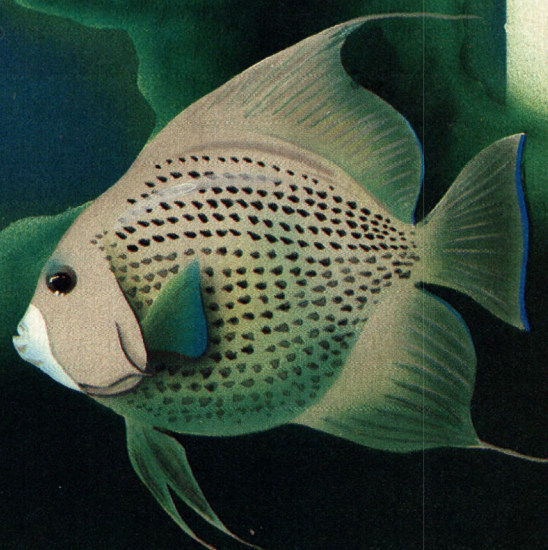
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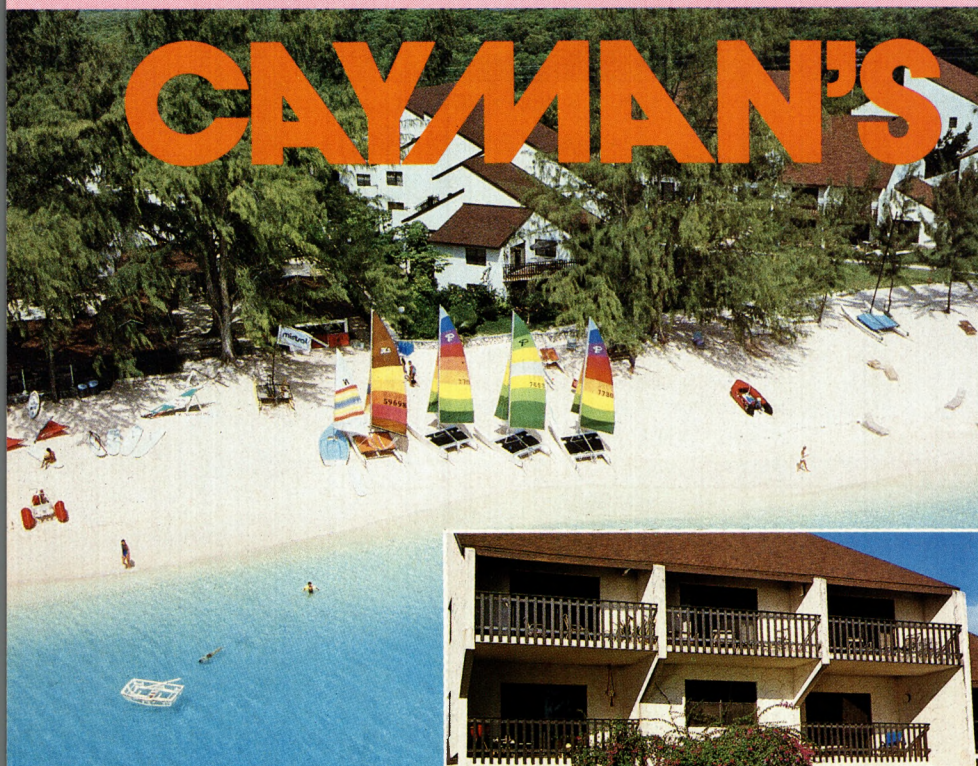


CAYMAN'S

CONDO CRAZE

A New Trend In Diving Vacations

BY BARBARA A. CURRIE



Top: An aerial view of the Villas of the Galleon grounds as well as colorful sailboats on the white sand beach. **Right:** Villas of the Galleon condominiums. Don Foster's dive boats offer convenient loading right on the beach. **Below:** Yellow vase sponge at Sentinel Rock. Condo accommodations offer the visiting diver the comforts of home, including maximum privacy and inexpensive meals.



Condominium: Curse the person who first used that word to describe the low-slung luxurious apartments along Grand Cayman's gold coast. This is where visitors with limited budgets can vacation like characters from *The Great Gatsby*, while enjoying some of the Caribbean's best diving—hassle free.

But, many divers still associate condo with confinement in chrome and glass monoliths, saddled with housekeeping duties they had hoped to escape. On Grand Cayman, it's just the opposite. Once you sample this lifestyle of seaside seclusion, you may join the ranks of condo converts whose repeat visits to dive Cayman have taken on a whole new pattern; not only wet adventures but dry



Marc Redt, general director of Hospitality World, Ltd., is the man behind the scenes that ensures divers' total satisfaction.

photos/Geri Murphy



hours spent languishing like landed gentry along Seven Mile Beach.

A repeat visitor and sporadic resident of this island for over a decade, I am a condo aficionado. The peace and privacy, space and seclusion this lifestyle offers suits seasoned travelers. So does the presence of God's gift to the veteran adventurer—a complete electric kitchen. The two bedroom, two bath beachfront units—the most popular selections on Seven Mile Beach—allow two couples or four singles to co-exist comfortably without suffocating. In Cayman's condos, there's plenty of room. And, you won't have to sacrifice any convenience you'd have at a full service hotel. Daily hotel-style maid service is included in the rates and excellent diving services are easily arranged thanks to the combined efforts of Don Foster's Dive Grand Cayman Ltd. and Hospitality World Ltd., the management firm for ten of Cayman's top condo properties, including Villas of the Galleon, George Town Villas, Turtle Beach, Tama-

rind Bay and Silver Sands. And, even better news: This condo-dive package holiday, when shared by three or four divers, is one of the Caribbean's best vacation buys. With the money you can save by occasionally eating in and sharing a unit, you can rent an air-conditioned car for a week.

Confinement? Hardly—if anything, this lifestyle offers maximum freedom and mobility if you choose.

Don and Jil Foster have been perfecting their "villa vacation" packages with Hospitality World president, Marc Redt, for the past three years. It gets better each season. More and more Cayman vacationers are discovering Hospitality World's selection of "homes away from home." Combined with Foster's professionalism as a full-service, multi-faceted dive operation they create a unique—and extremely economical—way to keep Cayman both interesting and affordable.

First class accommodations, first class diving and more: This is the only vacation option that allows divers to select their environment. Romantic recluses can opt for the secluded luxury of Villas Pappagallo's 45 beachfront units in West Bay.

opting for your own table d'hôte might be a comfortable alternative for most of your stay. A new, completely stocked supermarket at Coconut Place on West Bay Road, along with two delicatessen/gourmet shops, Coconut Deli and Waldo's, are centrally located and convenient seven day sources of almost any food item your whims may dictate. Cayman has come a long way lately and its markets are a continental cornucopia.

Lazy gourmets will find the Cracked Conch Catering Service—next to the popular West Bay Road restaurant—a superlative alternative to dining out. Twoordon bleu chefs, trained in England, pre-



Eager guests file up the boarding ladder in preparation for an exciting dive trip. Left: Scuba entries are easy from Don Foster's flattops. Below: Don and Jil Foster.



pare meals from a pre-set menu and deliver to your apartment. Seafoods, such as curried conch and lobster creations, are specialties and reasonably priced. They even offer a fully catered breakfast.

No more questions about comforts ashore—but it's the hassle of getting to the dive shop each day, right?

No problem.

Foster's has worked consistently during the past few years to expand without sacrificing its trademark of friendly, personalized service for customers. Divers who choose the condo lifestyle are provided with free pickup and return transportation, either by air-conditioned van or boat beach pickup, depending on the location of their condo property and existing weather conditions.

The headquarters of Don Foster's Dive Grand Cayman Ltd. is in the main building of the Royal Palms Hotel on Seven Mile Beach, just minutes from most of Hospitality World's properties. During the past year, the on-site facilities have

grown to include a new dive shop and branch of Jil's exclusive Ocean Designs boutique, as well as the complete operation of Don Foster's Ocean Photos Centre. Resident photo pro Brad Graham is available for beginning, advanced and underwater video instruction, as well as "photo buddy" underwater portraits and candid shots of diving guests. Camera rental and E-6 processing are other services offered. Customers can use the custom light tables to sort and review their work.

But the biggest surprise for Don's repeat clientele—which grows larger each season—was the very quiet arrival last September of two new custom 52 foot dive boats. They have been the talk of the island's dive industry ever since.

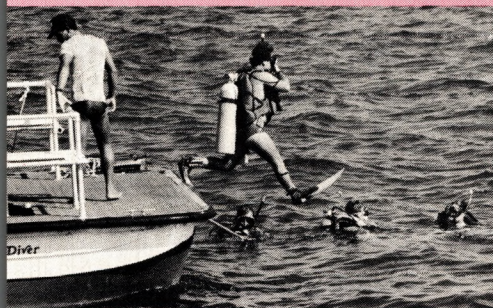
These two superb craft were Don's dream for a decade. The 34 year old veteran of Cayman's dive industry translated that dream into custom fiberglass reality in time for Scuba Bowl 1985. Built in Goodlettsville, TN by one of the top boat builders in the U.S., Carl Gibson, the design is registered under Don's name.

On these fine boats, with 14 foot beams, are features that delight seasoned divers. In addition to spacious decks there are features that make these additions to Foster's fleet real pleasure craft. Each has two changing rooms with freshwater showers; easy roll-in entry platform on the stern and simple, sturdy ladders for hassle-free exit on the bow. No more giant strides or giant strains for gear-laden divers. Perhaps the most unusual feature is the lighting system, designed to make night diving as easy as possible. Each boat is equipped with a floodlight capable of illuminating the beach area during pickup and loading, while other lights line the hull.

Comfortable and practical, the new boats have twin Volvo 165 hp diesel engines, meaning they are not only fast but fuel efficient. They are capable of 20-24 knots with a full load of divers and gear.

The rest of the Foster's fleet includes a 26 foot flattop, *Adventure Diver*; a 36 foot flattop, *Undersea Diver*; Don's dual-purpose 34 foot custom V-hull *Wavemaker*; and a 26 foot glassbottom boat, *Reef-seeker*. Known primarily as a 17 year veteran of Cayman's reefs and walls, Don is also a skilled saltwater angler and charters half and full day fishing trips for those wishing to chase billfish, wahoo, yellowfin tuna and dolphin (dorado) year-round. Limetree Bay and its adjacent marina is a favorite choice for visiting fishermen.

For information call Scuba Tours, toll free, (800) 526-1394; in New Jersey (201) 256-9115; or write: Scuba Tours, 5 Paterson Ave., Little Falls, NJ 07424. You can also write Hospitality World, Ltd., P.O. Box 952, Grand Cayman, BWI. On Grand Cayman, call Don Foster's Dive Grand Cayman Ltd., (809) 949-7025.



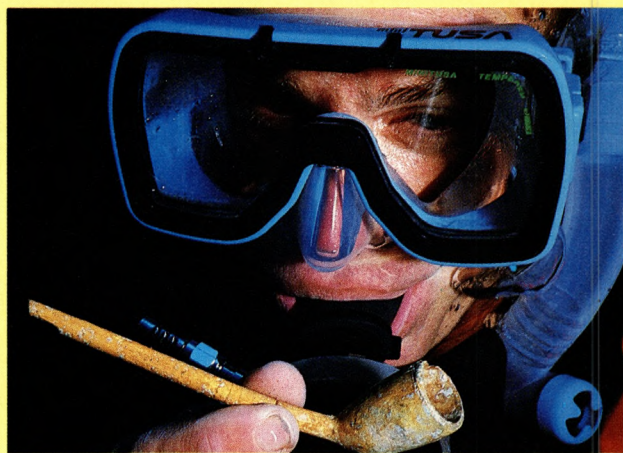
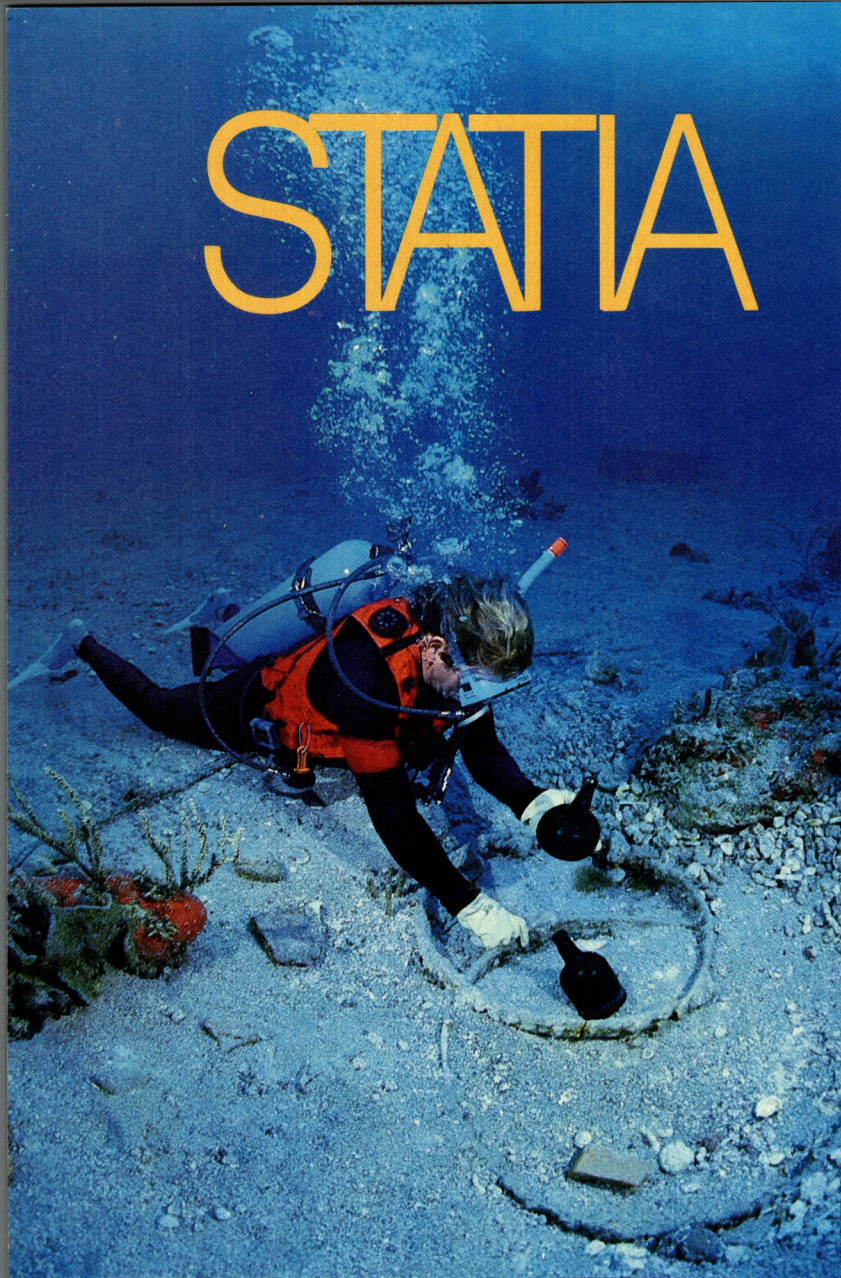
Spas, pool, satellite TV—and Grand Cayman's finest gourmet Italian restaurant, Ristorante Pappagallo—are the ingredients of this property's lagniappe. Foot-loose, night owl prowlers with bionic metabolism can find paradise at Villas of the Galleon or other condo properties close to the hotels and nightclubs along Seven Mile Beach. Day and night, a plethora of activities exists within walking distance, while privacy prevails the rest of the time you're ashore.

In short, the condo vacation is a "do what you please" recipe for perfection. If you want to dine out, Cayman's 1986 selection of restaurants ranges from elegant haute cuisine at Le Diplomat to delightful and informal inventive menus at Le Bistro in the Falls shopping center. And, there is everything in between from seafood to Burger King. With a rental car, you're within a short ride of satisfying any culinary craving you might have.

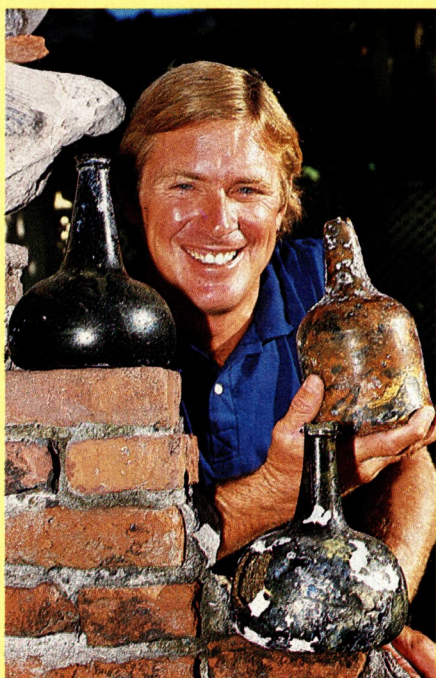
Since dining out anywhere—especially on Grand Cayman—can be expensive,

STATIA

St. Eustatius Is Diving's Newest Discovery In The Caribbean



Left: Mike Guderian at a site where he found old bottles. The circles in sand are old barrel hoops. Above: Guderian with a 18th century clay pipe. Below: The 39 foot *Discovery*. Bottom left: Guderian with old bottles.



TEXT AND PHOTOGRAPHY BY GERI MURPHY

St. Eustatius is a treasure chest hidden among the reefs of the Caribbean. It has always been there, but no one knew it. And, when discovered, this marvelous find yielded a wealth of surprises.

Here is a small secluded tropical island, slightly off the beaten tourist path. It is blessed with remarkable natural beauty, warm clear water and friendly inhabitants. A small beachfront hotel provides ample lodging, marvelous food and a first class dive center.

St. Eustatius drips with history. Ancient stone buildings give hint of a bygone era when it was an opulent trading center.

The bottom of the bay is littered with virgin shipwrecks, dating back more than 300 years, and half of the old port lies underwater. On top of the wrecks are reefs of living coral, loaded with an extraordinary variety of fish and marine life.

Put simply, St. Eustatius is a traveling diver's dream come true. It is one of the last Caribbean islands untouched by commercial development. With underwater visibilities exceeding 100 feet and water temperatures of 80°F plus, this island begs to be explored.

Where is St. Eustatius? This little island is in the eastern Caribbean, at the top of



Below: Hotel owners John May (right) and Marty Scofield display 17th century blue glass trading beads. Left: Old Gin House rooms and pool. Bottom: Statia Harbor and the ruins of Lower Town as seen from Fort Oranje.



the Leeward Islands chain. It lies 90 miles east of St. Croix and just 38 miles south of St. Maarten (St. Martin).

Surprisingly enough, St. Eustatius is easy to reach. You can fly there any day of the week, by going via St. Maarten. Several major airlines such as American, Eastern and Pan Am operate jet flights into St. Maarten from various U.S. cities, including Boston, New York, Dallas, Los Angeles and Miami. In addition, ALM flies into St. Maarten direct from Curacao or Aruba. From St. Maarten it is a quick, 17 minute flight to St. Eustatius aboard Windward Air, a twin Otter commuter ser-

vice. The 21 passenger aircraft makes five flights daily.

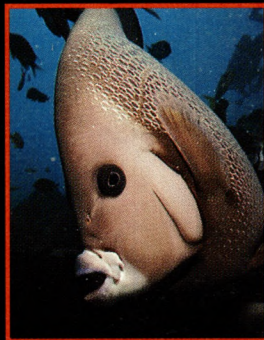
What is St. Eustatius? This island is part of the Dutch Caribbean (Netherlands Antilles); the same group that includes Aruba, Bonaire and Curacao. However, it is nowhere near Bonaire. It is, in fact, 515 miles northeast of Bonaire and is part of the other half of the Dutch Caribbean isles that includes St. Maarten and Saba.

While the government is Dutch, the islanders prefer to speak English, much like their neighbors in the Virgin Islands. Most of the residents prefer to call their island Statia and themselves, Statians.

As Caribbean islands go, Statia is exceptionally beautiful. It is a small piece of real estate two miles wide and four miles long. There are mountains at both the north and south end and a flat, pastoral plain in between.

The mountain at the south end of Statia is a perfectly formed volcano 1,800 feet high. The slopes of this singular hill are green with shrubbery and the crater is filled with a primeval rain forest that has grown undisturbed for hundreds of years.

Statia is a storybook island complete with a small settlement called Oranjestad and a population of 1,600 people. The



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The Old Gin House St. Eustatius, Netherlands Antilles

STATIA

town has all the earmarks of a colonial village, including narrow, cobblestone streets, a historic fort with bronze cannons, ruins of several ancient churches and a historical society museum. Much can be learned about Statia's early history during a walk through this quaint town.

Beyond Oranjestad stretches the rural countryside, with small farms and pastures. Sheep, goats and cattle graze along the roadsides, unrestricted by fences. The lush growth of palm trees, hibiscus and other greenery is evidence of a truly tropical climate.

Statia is an island steeped in history and its legends would fill volumes. It is hard to imagine that this quiet, uncrowded island was once the richest trading center in the New World. In its



St. Eustatius can be reached directly from St. Maarten on Windward Air flights.

heyday, Statia was visited by 3,000 ships a year. It was not uncommon for 200 ships to be anchored in the bay at any one time.

However, Oranjestad was much more than a trading port. It was a busy center for commerce, smuggling and piracy. All three were intertwined in the prosperity of this boom town. The residents of that time were engaged in many business ventures including slave trading, growing tobacco, producing cotton and the raising of sugar cane. From the mid 1500s to the mid 1800s Statia was exceptionally busy and an estimated 9,000 people lived there.

One of the most interesting aspects of Statia's history is its close link to the United States. Almost all of the rifles and cannons used during the American revolution were smuggled through Statia. And, on November 16, 1776 Statia was the first country to recognize the independence of the United States.

During its colorful history, the island changed governments 22 times and there were many battles among the Dutch, English and French. Still standing today are the stone and brick ruins of



The island of St. Eustatius (Statia) is at the top of the Leeward Islands chain in the eastern Caribbean, 90 miles east of St. Croix and 38 miles south of St. Maarten.

many colonial forts, public buildings and warehouses that once held the treasures of the West Indies.

Nestled at the base of the cliff overlooking Oranjestad Bay is a one-of-a-kind hotel called the Old Gin House. It is in the center of the stone ruins of the once bustling seaport called Lower Town. The ho-

tel is actually built in the ruins of a 125 year old cotton gin factory and warehouse. Much of the main building has been restored and filled with furnishings that date back more than a century.

The resort is a cluster of six small buildings. The office/check-in lobby is right on the road. Behind it is the terrace

and a two story building containing six rooms right on the water. Balconies are actually over the water, similar to Bonaire's Flamingo Beach. Across the street, set back from the water, is the main dining room and bar—Mooshay Bay. Behind Mooshay is a secluded courtyard and freshwater swimming pool. Overlooking the courtyard is a two story building containing 14 rooms. This is set against a mountainside and the rooms are cooled by a natural breeze.

Breakfast and lunch are served on the open air terrace dining area overlooking the sea. Guests are serenaded by the soft sound of surf while enjoying the specialties of the house. Lunch is inspiring and can include such delights as real French onion soup, fettucine with mushroom sauce or linguini with conch sauce.

Dinners are spectacular, for the Old Gin House is recognized as a world class gourmet restaurant. The hotel has been featured in Time, Forbes, Gourmet and many other magazines. Each evening at 7:30 pm, a four course meal is served, including two types of wine. Specialties include such remarkable entrees as poached filet of sole stuffed with lobster; sliced lamb with anchovy cream sauce; roast duck with sweet and sour sauce; veal Marsala or filet mignon with Bearnaise sauce. The soups, appetizers and desserts are equally exotic.

The Old Gin House is owned and operated by John May and Marty Scofield, ex-



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STATIA

advertising executives from New York. They have lived on Statia for 16 years and have built this unique resort with their own hands. John and Marty are history buffs and well versed in the culture of the island. Their tales and legends of old Statia provide a source of endless entertainment for wide-eyed guests, who hang on every word.

By now, you might be wondering why Statia has not been a popular dive destination in the past. The key that finally unlocked this treasure chest is a brand new dive center right next door to the Old Gin House. The reefs and wrecks of Statia are now accessible to visiting divers.

Known as Surfside Statia, this new dive center is a modern scuba facility with two air compressors, 60 scuba tanks, two dive boats, a scuba boutique and very professional management.

Surfside Statia is owned by partners Mike Guderian and Joe Donahue. Mike is originally from Marlin, Texas and a graduate of North Texas State University. He started diving in 1977 and was the manager of a Texas dive store. In 1980, he moved to Grand Cayman and worked

Surfside Statia's 39 foot dive boat *Discovery* on a snorkeling trip at Jenkins Bay.



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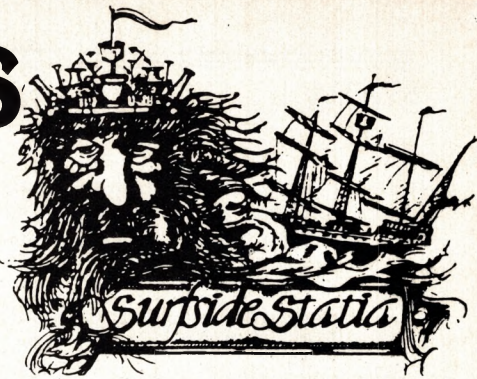




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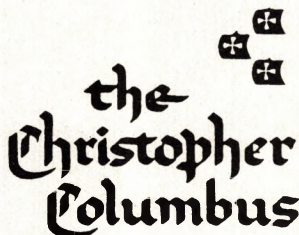
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there as a divemaster for several dive operators, including Surfside Watersports. After scouting a number of different Caribbean islands, he settled on Statia.

Joe Donahue is from Scranton and a veteran Pennsylvania dive store owner and watersports operator. He is presently the owner of Surfside Watersports, which has three dive operations on Grand Cayman. Joe operates the booking office in the U.S. while Mike is the onsite manager and chief divemaster at Statia.

A third member of the Surfside Statia team is Meredith Crisp, retail manager. Originally from Australia, Meredith has lived and worked on Grand Cayman as a divemaster. She currently handles all equipment rentals, trip bookings and the scuba boutique.

The fourth member of the team is Carlos Hotman, operations manager. He was born on Statia and has lived there all his life. He is in charge of compressor and boat operations and truck transportation.

Surfside Statia has two dive boats to accommodate different sized groups. The largest is the *Discovery*, a 39 foot custom built dive boat with a GM 671 diesel. It is an extremely comfortable and dry craft that can carry up to 20 divers. For smaller groups, there is *Little Statia*, a 17 foot Avon inflatable powered by a 20 hp Johnson. It can carry up to eight divers and is especially good for short trips.

Surfside Statia offers the standard dive trip service of up to three dives (three tanks) per day. The morning trip departs at approximately 9:00 am and consists of two dives (two tanks) at different locations, returning at approximately 12:30 pm. The afternoon trip is a one tank dive departing at 2:00 and returning about 3:30 pm. Night dives are available on request and can be made either from the shore or a boat, usually after dinner.

The nice thing about Surfside Statia is the compactness of operation. The dive center is only a few steps from the hotel breakfast area and the majority of dive sites are directly in front of the hotel. Most boat rides are barely five to ten minutes long. Getting from the dive center to the boat is accomplished by a short ride in the "White Devil," a new Daihatsu truck.

Statia is unique among Caribbean dive locations. This island offers an extraordinary combination of coral reefs, fish life and historic shipwrecks. It is rare that one finds ancient anchors, cannons and antique bottles sitting in crystal clear water. Most of the diving is in 20 to 80 feet of water, a comfortable, safe range for sport divers. And, snorkeling is exceptional, with both shallow coral gardens and a sunken city to explore.

Bob Marx, who first visited Statia in 1978, believes that up to 200 ships may



An aerial view of the beachfront hotel, Old Gin House, on the island of Statia.



The interior of the scuba boutique at the Surfside Statia dive center in Oranjestad.

be sunk in Statia waters and he indicates the seaport was destroyed on at least three different occasions owing to a violent earthquake, a severe hurricane and the attack of the British Navy. As a result, the bottom of Oranjestad Bay is a jumbled maze of artifacts from three different centuries. It is one of the largest underwater puzzles of maritime archaeology. A diver is likely to find two antique bottles side-by-side—one Dutch and the other English—dating a century apart in age.

Of the dive sites found so far, Supermarket seems to be the most fascinating. This site is one-half mile straight out from the hotel in just 60 feet of water. It was named for its incredible variety of diving opportunities. Supermarket consists of two shipwrecks that lie parallel to each other and less than 50 yards apart. While the origin of these ships remains unknown, one wreck appears much older than the other. Both are buried under sand and several beautiful coral patches have grown over them. As a result, the wreck sites are loaded with colorful



The Statia historical society museum offers visitors a look into the island's past.

sponges, schools of fish and exotic marine life. The site is great for fish watching, U/W photography or historic exploration. There is something there for everyone and plenty of room to spread out.

My favorite spot at Supermarket is a coral formation known as Cottonwick Rock. At the south end of the older wreck, this site consists of a coral rock formation 30 feet long by 10 feet wide. The formation rises up off the bottom about six feet and is undercut all the way around. It gets its name from a school of 50 cottonwicks that nestle beneath the rock, pointing into the slight current. These lovely fish have a white body with a wide black band on the dorsal fin and upper tail. They have light yellow stripes along their sides and a smaller black band running from the nose to the eye. They are a type of grunt indigenous to the eastern Caribbean and Bahamas but seldom seen in Cayman or Roatan.

In addition to the cottonwicks, the rock is covered with colorful sponges and corals. Beneath the ledge one finds black



Statia diver Paul Grissmann displays a musket found at 30 feet in Oranjestad Bay.



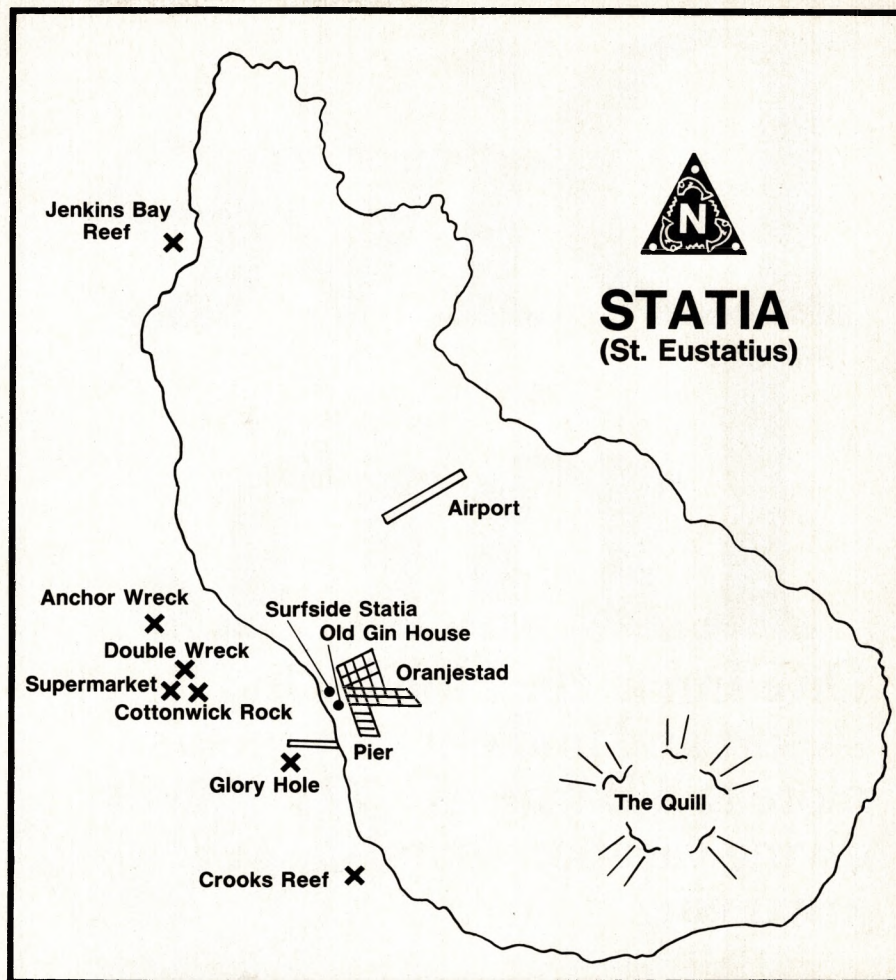
Mike Guderian (left) and Joe Donahue examine 17th and 18th century bottles.

bar soldierfish, squirrelfish and even a resident black and white spotted moray eel. The eel uses the rock as a cleaning station and the cleaner is an exquisite yellow and red scarlet lady shrimp with bright white antennae.

Nearby, there are many other photographic subjects, including purple tube sponges, a lovely iridescent vase sponge and a cluster of blood red tube sponges. Off Cayman, blood sponges are usually found deep on the wall, below 100 feet. Off Statia they grow in 60 feet of water.

Supermarket is an incredible playground for all types of marine life. On a single dive, our group sighted several stingrays, a large amberjack and at least two flying gurnards. On the next dive, Joe Donahue was confronted by a 300 pound green turtle that passed within one foot of his mask!

The flying gurnard is one of the strangest and most beautiful creatures of the Caribbean, but is rarely seen by divers. Off Statia, visitors are likely to see at least one on every dive since the bottom of the



A variety of near-virgin dive sites are visited by divers from Surfside Statia. Flooded portions of Oranjestad and numerous wrecks offer many relics, including old bottles.

bay is crawling with them. Flying gurnards range from 12 to 18 inches in length and look something like a sea robin. Their name is derived from a magnificent set of pectoral fins that spread out like wings and allow the fish to fly or glide with great maneuverability. Although the coloration of the fish is basically black and white spots, the pectoral wings are a breathtaking array of iridescent blue spots and stripes mixed with bands of black and white. The fish is incredibly beautiful and fascinating to watch as it walks along the seafloor using its ventral fins much like a pair of small legs.

Another shipwreck site farther to the north is marked by a large anchor, just sitting on the floor of the bay in 70 feet of water. The anchor measures an estimated 14 feet in length and the upper fluke rises off the bottom five feet. Since the anchor has an iron cross bar it is estimated to be post 1820 and of British origin.

While the anchor may not be as old as other artifacts in the bay, it does make an excellent subject for underwater photos. Another interesting aspect of the anchor is the family of three jackknife fish that lives under it. These black and white banded reef tropicals are always there and rarely stray from their anchor home.

In addition to the many shipwreck sites

in Oranjestad Bay, Statia has many beautiful coral gardens and shallow reefs. Jenkins Bay is a favorite for snorkelers and beginning divers. Crooks Point is a medium depth reef consisting of elkhorn corals, giant yellow seafans and tall sea-whips. This spot has several nice stands of pillar coral and you are likely to encounter some very large blackspotted snake eels.

As for wall diving, some of the finest drop-offs and pinnacles in the eastern Caribbean can be found at nearby Saba Island. At least once each week Mike conducts an all day boat trip to Saba aboard the *Discovery*. The 13 mile trip takes approximately two hours and guests have an opportunity to go ashore and tour this unique mountain top island.

Statia is indeed a rare find for the traveling diver. Seldom does one experience the combination of a friendly, informal beachfront hotel, spectacular gourmet food, a top notch dive center, warm water, excellent visibility, coral reefs, drop-offs, unusual fish and shipwrecks galore.

For more information about diving Statia and reservations, contact: Surfside Watersports, 330 South Main Avenue, Scranton, PA 18504, telephone U.S. toll free (800) 468-1708 or in Pennsylvania, (717) 346-6382. x

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HOLIDAY INN

(Continued from Page 67)

activity a visitor could wish. There is a magnificent freshwater pool, two restaurants, three bars, four tennis courts, a lobby boutique/magazine store, a hair styling salon, a jewelry store and a beachwear shop.

The pride of the Holiday Inn is the Wreck Of The Ten Sails, a nightclub just off the lobby. It offers live entertainment nightly: the best on Grand Cayman by far. The star of the show is the Barefoot Man and his band. Barefoot is an extremely talented Caribbean singer who writes much of his material. He has produced six albums, two of which—Scuba Do and Scuba Do Two—are filled with original diving songs.

The Holiday Inn has just completed a \$2 million renovation of the hotel and guest facilities. Starting at the front door, the hotel lobby was stripped out, enlarged and remodeled. It can now accommodate guests more efficiently.

Each guest room has been stripped and refurbished with new floors, wallpaper, lighting fixtures and drapes. The Veranda Room restaurant has been remodeled and has a new cocktail room. This dining facility now serves a fast, efficient buffet breakfast starting at 7:00 am. A salad bar has been installed for lunches.

The outside grounds have been improved, with new landscaping, a drinking fountain by the pool and a new tent for beach parties. The conference rooms have a new sound system. Additional meeting rooms are planned.

Overseeing this major transformation is general manager Reimund Kienast. He is a professional hotelier with more than 30 years of experience. He came to the U.S. in 1964 from Hamburg, Germany and spent 20 years at many famous inns, including the Berkeley Marriott, Amelia Island, Houston Marriott and Kona Surf.

Kienast has also been a diver for 15 years. He received his scuba training at Lake Travers, Austin, Texas. He has come a long way from the zero visibility and mud bottom of an inland lake check-out. Kienast came to Grand Cayman in September 1984 to take over management of the Holiday Inn.

One of the major attractions of the Holiday Inn is Aqua Delights, the largest watersport operation in the Cayman Islands and possibly the Caribbean. Owned and operated by Jim Brown, Aqua Delights has been at the Holiday Inn beach since 1980. During this six year period, Brown has amassed a tremendous fleet of 80 different watercraft worth more than \$1 million. Hotel guests can rent anything from a self-peddling aquatrike to a jet ski. Sailors have their choice of inflatables,

Hobie Cats, O'Day sailboats, windsurfers and other vessels. The more daring may wish to try waterskiing or parasailing.

One of Aqua Delights' most popular activities is a sunset cruise aboard the 60 foot catamaran, *Buccaneer*. Guests board the vessel right at the hotel beach for a lovely sail, unlimited drinks and a dinner of fresh seafood or steak. The cruise lasts for more than two hours.

During the day, the *Buccaneer* and her sister catamaran, *Gato*, conduct combination sail and snorkeling trips to shallow coral reef gardens such as Eden Rock. Jim Brown has recently been joined by his daughter, Tishan, in the management of this business. The company will soon bring on line a 100 foot schooner named *Blackbeard's Lady*, which will also be utilized for daily cruises.

The other major attraction at the Holiday Inn is Bob Soto's Diving Ltd., Grand Cayman's best known scuba diving and snorkeling operation. In business for more than 25 years, this extensive organization includes a fleet of eight custom dive boats, hundreds of scuba tanks and a staff of 20 certified scuba instructors.

The Holiday Inn serves as headquarters for Bob Soto's dive boat boardings: These craft are specifically designed to pull up onto the beach. Front drop ramps are lowered to the sand and guests walk on board with ease. The boats are spacious, comfortable, dry and provide ample shade.

Under the expert supervision of owner/manager Ron Kipp, Bob Soto's Diving runs with the smoothness of a Swiss watch. Dive boats depart precisely on time, the crew is courteous and guests are well briefed at each reef site. A great deal of attention is focused on scuba safety. As an ex-IBM executive, Kipp has put his experience and organizational skills to good use.

Bob Soto's diving offers a morning two tank dive with the boat departing the Holiday Inn beach at 9:00 am. The first site is a wall dive at one of a dozen drop-offs such as Trinity Caves, Big Tunnel, Big Dipper, Orange Canyon, Sand Chute, Round Rock or Eagle's Nest. After a rest and appropriate surface interval, the boat is moved to a second site for a reef dive. Depths range from 30 to 50 feet at such sites as Spanish Anchor, Three Tree Reef, Aquarium, West Bay Reef and Hammerhead Hole.

A daily afternoon dive is scheduled for a 2:00 pm departure and this single tank trip is usually a medium depth excursion to such sites as Soto's South, *Balboa*, Devil's Grotto, *Oro Verde* and Hamburger Reef. Night dives are also scheduled twice weekly—on Tuesday and Saturday—and special charters can be arranged upon request.

The Holiday Inn, together with Bob Soto's Diving, offers a variety of attractively priced scuba diving packages that make

(Continued on Page 84)

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Top: A diver explores lush coral formations at French Reef, Sea Dwellers. Above: An aerial view of the Holiday Inn pool. Right: T.J. and Jan Holub inside the Sea Dwellers retail store and dive center. The Sea Dwellers/Holiday Inn combination is a perfect choice for divers visiting Key Largo. Nearby sites include Molasses Reef, the Christ of the Abyss statue and the *Benwood*.

The shortest distance between the U.S. mainland and the American tropics is the place the Overseas Highway leaves the peninsula for the Florida Keys. These are the islands you can drive to—a recognized paradise for vacationers, sportsmen and scuba divers. It is conservatively estimated the Keys play host to over 300,000 divers annually. And, for good reason: They harbor the only well-developed coral reefs off the U.S. coastline.

The first major island in the Florida Keys is Key Largo. Once known only because of the Bogart movie of the same name, Key Largo today is rural but expanding with hotels, shopping centers, marinas, restaurants and condominiums. Partially because of its short distance from the mainland, partially because of the reefs offshore and partially because it is the location of the Key Largo National Marine Sanctuary, this island is the most popular diver service area in the Keys. It

double or king sized beds—all in the heart of Key Largo. Whether you're a single, a double, or require a special party for 125 people, the friendly staff is capable of handling the assignment.

Your dive boat, the 50 foot twin-diesel, state-of-the-art *Sea Dweller III*, is at the Holiday Inn dock—a short walk from your hotel room. To my knowledge, it is the shortest distance between hotel and boat in the area. The *Sea Dweller III* is spacious and comfortable—a modern glass-hulled dive boat, U.S. Coast Guard certified for 46 passengers and fully equipped with tank racks, platform/ladder system, large storage areas and wash buckets.

The Sea Dwellers full-service dive shop and retail store is directly across the highway from the waterway. Besides the complete array of dive support services, the store is a treasure of tropical clothing and merchandise, nicely displayed within a nautical theme.

couple lives aboard a boat at Ocean Reef (Marina/Resort) and, occasionally, takes a week off to run crew boats and supply vessels in New Orleans.

The reefs of Key Largo are impressive and legendary. The fish life is, quite simply, spectacular. Although a winter or early spring blow can sometimes disturb normally good visibility, when conditions are right (80 percent of the time), the Florida Keys offer a magnificent seascape.

My favorite spots are the obvious—French and Molasses Reefs. Molasses is almost without equal as a Western Atlantic fish haven and French is an exciting area of diversity with cave and coral formations. Nearby are other diving legends—the Christ of the Abyss statue and the *Benwood* wreck.

T.J. is especially good at selecting sites that appeal to groups and individuals. His many years of diving Key Largo allow him to make the best choice for visibility and conditions.

Sea Dwellers is a recognized trendsetter in the Key Largo area. More than ten years ago they initiated the Key Largo weekend, combining a pleasant stay with diving excitement and a Saturday night cookout/party. They are currently featuring a certification vacation at the Holiday Inn. The one week program offers a wonderful way to receive an open water certification from start to finish. The first morning is spent with scuba gear introduction in the beautiful Holiday Inn pool. Weather permitting, all other training dives are done in protected open water areas off Key Largo.

Depending upon scheduling, afternoons or mornings can be free for fishing trips, snorkeling tours, glassbottom boat rides, shopping (a huge shopping center complex is within walking distance) or alternative excursions. One of the best is the Snorkel with the Dolphins program offered in a protected habitat by Rick and Brigitta Borguss. An introduction to the program and a half hour snorkel with these incredible marine pets will be the topper to your ocean holiday. Sea Dwellers has the details.

Recently, a derelict freighter was sunk as a new diving attraction off Islamorada. Rumor has it that an artificial reef program is underway and several wrecks will be placed in the Key Largo area, possibly within the marine sanctuary.

Holiday Inn has the location, comfort and attractions. Sea Dwellers has the full-service dive operation, complete with a professional crew and modern equipment of the highest caliber.

Packages are available for a variety of popular day/night combinations. Contact: Sea Dwellers Dive Center, 99850 Overseas Highway (Mile Marker 100), Key Largo, FL 33037; (800) 451-3640 toll free, (305) 451-3640 Florida, 245-0333 Miami direct. 🐠

Sea Dwellers

Anatomy Of A Successful Dive Operation

TEXT AND PHOTOGRAPHY BY RICK FREHSEE

is said there are more dive stores and boats to be found in the ten minutes it takes you to drive through Key Largo than in any other place in the world.

Which leads to a very welcome dilemma—with so many operations to choose from and competitive prices and services, how does one select a host operator? The answer is: Examine the convenience of the hotel; the size of the boat; and the personality, character, professionalism and reputation of the operator.

An excellent choice is the Key Largo Holiday Inn/Sea Dwellers Dive Center combination. To begin, the logistics are unbeatable. Bordering a deep waterway on the oceanside just off U.S. 1, the beautiful Holiday Inn can easily be reached by car, boat or private plane (Key Largo airport is two minutes away). However you travel, you'll be pleased to make the lush, tropical Holiday Inn a vacation home. There is a magnificent pool, lighted tennis courts, Bogart-theme lounges and restaurant (Greenstreet's Dining Room, Casablanca Lounge) and 132 comfortable rooms and suites with

Sea Dwellers has been in Key Largo nearly 14 years and is still owned and operated by the same family. Jan and T.J. Holub are exceptional people and Sea Dwellers is an exceptional dive business. T.J. is a licensed commercial pilot, a certified scuba instructor and the president of the Keys Association of Dive Operators. T.J. holds a Merchant Marine master's license to carry passengers in any ocean 200 miles from land in a 500 ton vessel. His wife Jan has exactly the same ticket, originally earned 11 years ago—a year before her husband. T.J. has talent, commitment, infectious enthusiasm, broad experience and considerable wit and charm. He has, or rather is, a character—with precious little competition: One of the biggest problems he has had over the years is getting off the boat. People come to Key Largo just to dive with T.J. Holub.

T.J. has assisted me with several photo shoots over the years and Jan, also an excellent photographer, helped with the modeling for a U.S. Divers catalogue. Today, Jan is the store manager. The salty

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HOLIDAY INN

(Continued from Page 81)

this resort affordable for just about anyone. During the winter months (December to April) this resort offers a Super Diver package of three lengths: three nights, five nights or a full seven nights program. During the summer season (April to December), there is the Holiday Inn's traditional and highly successful Guaranteed Dive Vacation. This program offers diving, room and extras for an attractive low price plus a written guarantee with a money back clause.

For more information on the Holiday Inn packages and reservations, see your travel agent or contact: The Holiday Inn Grand Cayman, 5100 Poplar Avenue, Suite 2219, Memphis, Tennessee 38137; telephone (800) 421-9999.

PALAU

(Continued from Page 65)

softball-sized bodies providing visitors with an unforgettable experience.

Off a nearby, flat, sandy beach lies a bed of *Tridacna* clams. These mollusks vary from one inch to legendary four foot dimensions. Their mantles display a wide array of colors and textures, wavering slightly when a diver nears and closing with a whoosh when touched.

Soft Coral Garden is a snorkel trip through an archway lined with beautiful Alcyonaceans (soft corals). During the tide shift, water surging through the passage carries snorkelers on a whirlpool tour through this beautiful sight.

Ngarol Island is honeycombed with a labyrinth of caves and passageways. One such cavern is known as Chandelier Cave. Entrance to the first chamber is ten feet below the surface. Diver's lights pierce the crystalline water, reflecting back ominous shapes of submerged stalactites. Continuing deeper into the cave, divers pass by ceilings lined with scores of these alien dripstones. The third and rearmost chamber ascends to above water and divers can surface, remove gear and crawl through a narrow passageway to two rooms farther back. Lights can be turned off for the return to the entrance.

Guided by the glow of the outside light, eerie reflections off the silent monoliths exemplify the alien, exotic, adventurous and historical diving available on Palau.

For more information about package trips to Palau and other tours, contact Art Travers at: Poseidon Ventures Tours, 359 San Miguel Drive, Newport Beach, California 92660; (800) 854-9334, (714) 644-5344; and 505 N. Belt, Suite 675, Houston, Texas 77060; (713) 820-DIVE.

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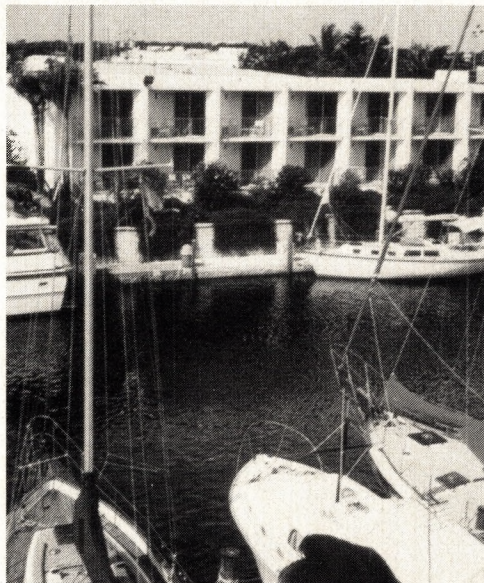
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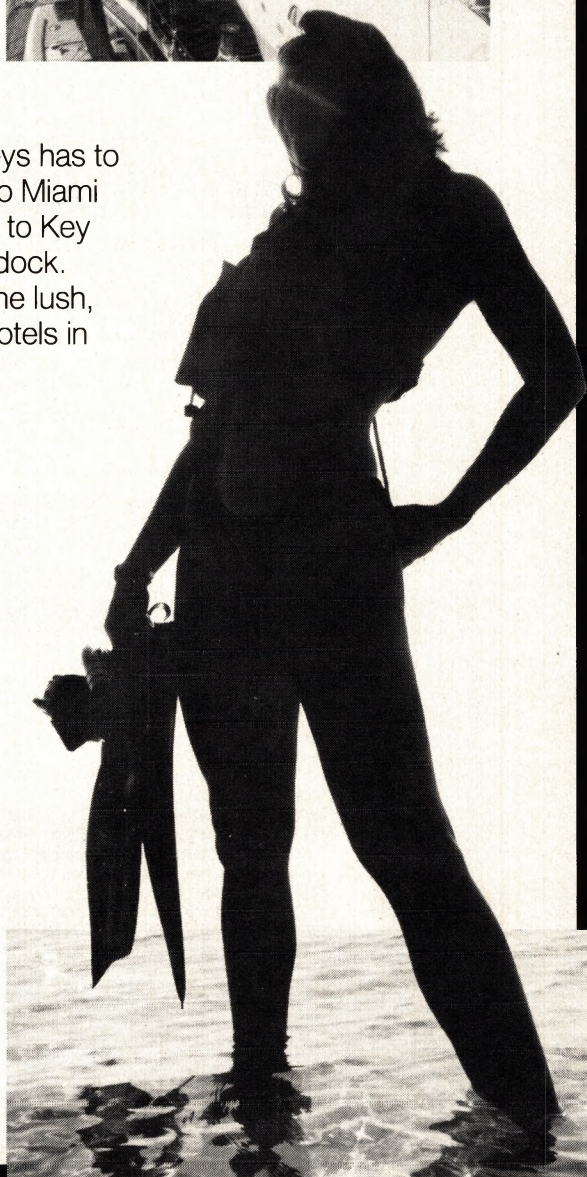
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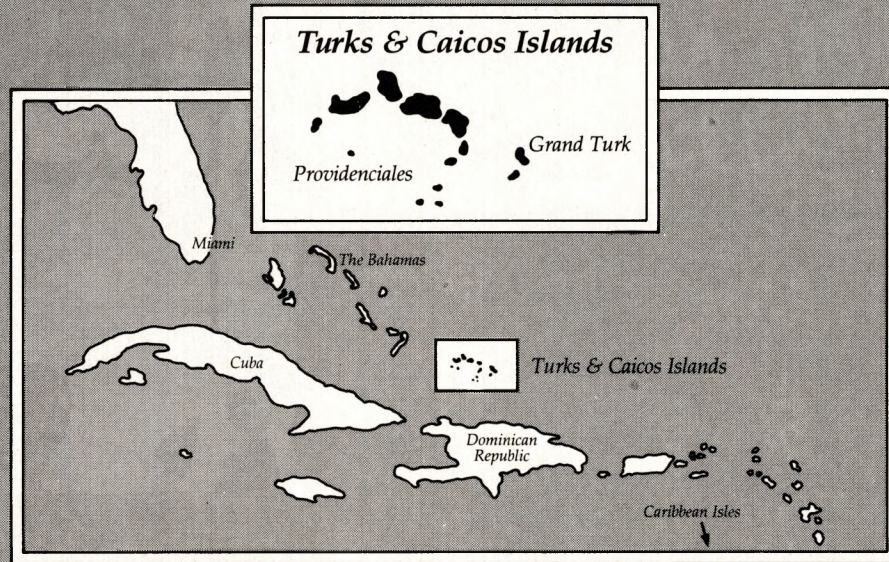
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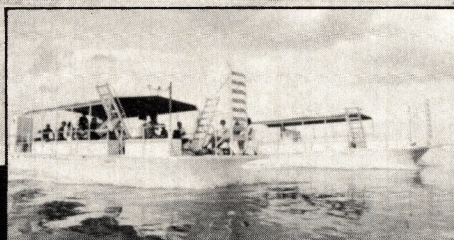


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MITCHELL/LADY CYANA

Lady Cyana Divers of Islamorada, FL has added Capt. Lisa Mitchell to its staff. Mitchell, a scuba instructor since 1980, has assumed dual responsibilities as



scuba training director and operator of the 40 foot *Lady Cyana*.

Lady Cyana Divers is a full service dive shop in Islamorada offering a complete line of scuba equipment sales, rentals, service, air, instruction and dive trips. The *Lady Cyana* and the 60 foot *Lady Cyana II*, both Coast Guard approved custom dive boats, sail twice daily from their facility at Mile Marker 85.9 on U.S. 1 in Islamorada. For further information contact captains Mitchell or Follmer at Lady Cyana Divers; (305) 664-8717.

NAHR/HABITAT

Andre Nahr is now in charge of Habitat's Five Star PADI dive operation on Bonaire. Nahr, who can teach diving in five languages, was born on Curacao but has dived extensively in Europe, including the North Sea, Spain, Italy, Sicily and the South of France. He first came to Bonaire in 1982 as a divermaster at the Flamingo Beach Hotel. He left to obtain more advanced training in Holland, coming to Habitat in 1984 as assistant manager of the diving department. He also taught photography until he became dive operations manager.

Nahr recently purchased a trailer in which to teach underwater video and still photography. Work on completing this classroom facility is underway.

POSADA DEL SOL

Posada del Sol has been extensively renovated recently and has emerged as a luxurious 16 room hotel set along the seaside on the picturesque Bay Island of Guanaja. The hotel features a freshwater swimming pool, restaurant and lounge. One of the resort's attributes—from a diver's point of view—is that dive sites are accessible with just a short boat ride on both the windward and leeward sides of the island, assuring predictably fine diving in virtually any weather. The management team of George Cundiff and Gene Martin is committed to developing Posada del Sol into a very special dive destination in the western Caribbean. They have established a toll free reservation number: (800) 227-DIVE; in Florida (305) 858-DIVE.

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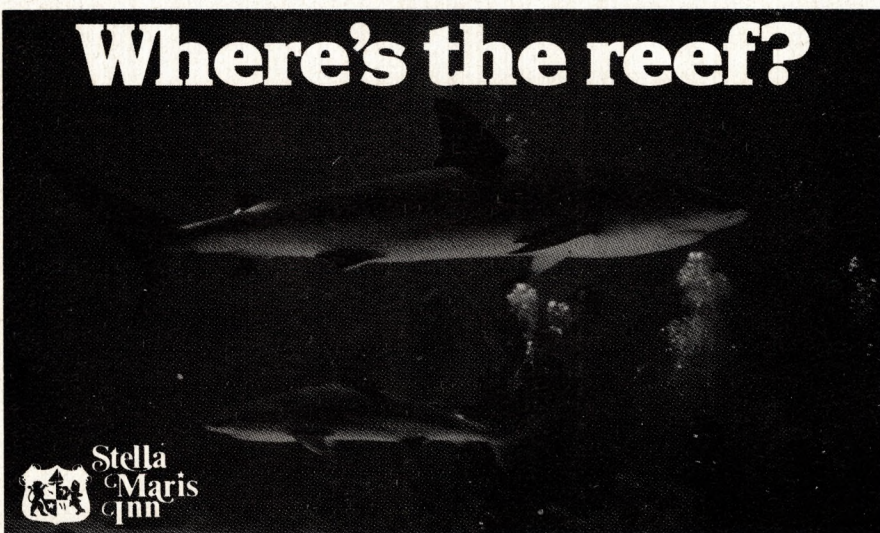
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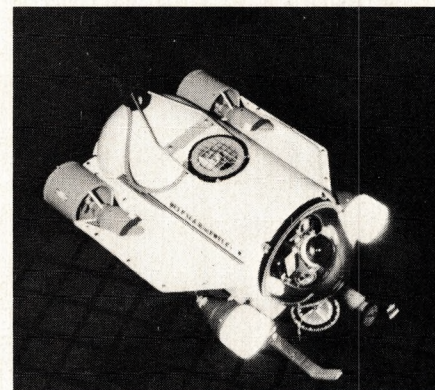
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The Coming Of The ROV's

Remote Control For Everyone In The Near Future

BY CHRISTOPHER SWANN

Even for an adult unaccustomed to video games it was surprisingly simple. With two joysticks I was able to make the cable-controlled, twin-torpedo-like Phantom 500 cruise ahead, reverse, turn and go up and down. On the control console, between the joysticks, a five inch color monitor gave a clear underwater picture and LED displays showed heading and depth. At the other end of the pool a pair of stubby bright yellow machines with acrylic nose domes, known as MiniRover and RTV-100, buzzed around each other like angry wasps. Portable and costing



photo/Benthos, Inc.

Deep Sea Systems' MiniRover

less than \$30,000, these three remotely operated vehicles (ROVs) may well change the way a good deal of underwater work is done and open the ocean to entirely new classes of users.

Until October 1983, when Christopher J. Nicholson, president of Deep Sea Systems International of Falmouth, MA introduced his suitcase-sized MiniRover, ROVs were beyond the reach of all but the oil industry and the military. Costing, typically, up to \$500,000 and weighing 2,000-3,000 pounds, full-size ROVs are highly sophisticated deep-diving machines, requiring both complex surface support and highly trained crews. Nicholson saw the need for a simple ROV, designed primarily for inspection, that could be operated by two men from



Phantom 500

a small boat, at a price that would put it within range of small organizations.

The vehicle Nicholson came up with is a 26 inch long tubular unit operable to 600 feet, weighing between 55 and 60 pounds and powered by one vertical and two horizontal thrusters at up to 1.5 knots. A low-light color TV camera on a tilting mechanism behind the plexiglass nose sends a video picture to the surface through the umbilical that brings power to the vehicle. When the camera is tilted down, the compass and depth gauge mounted between the vehicle's skids appear at the bottom of the TV screen. Illumination is provided by a pair of 150 watt quartz halogen lights.

For \$26,850 you get the vehicle, a surface control console (TV monitor not included), a hand control box and a 250 foot umbilical. Extras include a simple claw, a 35mm camera and strobe, a high-thrust package, extra-long umbilicals, spare parts kit and a navigation and tracking system.

Deep Sea Systems has sold MiniRovers to customers ranging from small diving contractors to the U.S. Navy and Disney World. It was a MiniRover—dubbed *Toto*—that was featured in the NBC SeaQuest series. Nicholson has now come out with a larger version, known as SeaRover, that sells for \$40,000, weighs 80 pounds and operates down to 800 feet at up to four knots.

Phantom 500 is the brainchild of underwater vehicle designer Graham Hawkes of Deep Ocean Engineering of San Leandro, California, the man responsible for the *Wasp*, *Mantis* and *Deep Rover* one-man submersibles. Introduced at the annual ROV Conference and Exposition in San Diego in April 1985, the vehicle is 60 inches long, weighs 68 pounds and travels at 2.5 knots. The pressure hull consists of four aluminum tubes mounted on a detachable stainless steel frame, the two main horizontal tubes each containing a horizontal thruster at the aft end and a 150 watt light at the forward end. The third, horizontal tube houses a fixed Hita-

(Continued on Page 94)

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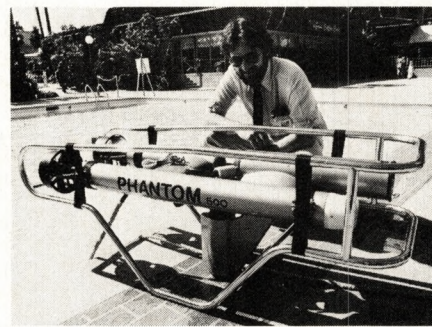
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PORTABLE SUB

(Continued from Page 91)

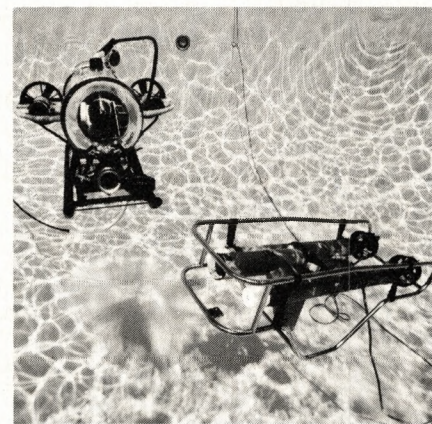
chi low-light color TV camera with a 100 degree wide angle lens behind a scratch-resistant, optically corrected flat port (the prototype was fitted with a dome port). The vertical thruster is contained in the fourth, vertical tube. A depth sensor and an electronically-driven flux gate compass relay depth and heading to the surface. Interestingly, Hawkes made extensive use of computer modeling during the



Phantom 500 has a tubular construction.

design phase, using software he developed for his *Deep Rover* submersible.

Phantom is operable to 500 feet, a depth Hawkes considers a practical maximum for working out of small craft such as inflatables, although the company displayed a 1,000 foot version equipped with a second TV camera on a pan-and-tilt unit at the Oceans '85 exhibit in San Diego in November 1985. The standard



Mitsui's RTV 100 meets Phantom 500.

Phantom with 500 foot umbilical, control module (with operating instructions in the lid) and tool kit runs \$28,400. Extras include a lateral thruster, sonar, a three-function seawater arm, a force-feedback manipulator and a "contact sensor" (a sort of hydrophone that, when fitted to a manipulator, can be used as a stethoscope to determine, for example, whether fluid is flowing in a pipeline).

RTV-100, built by Mitsui Engineering

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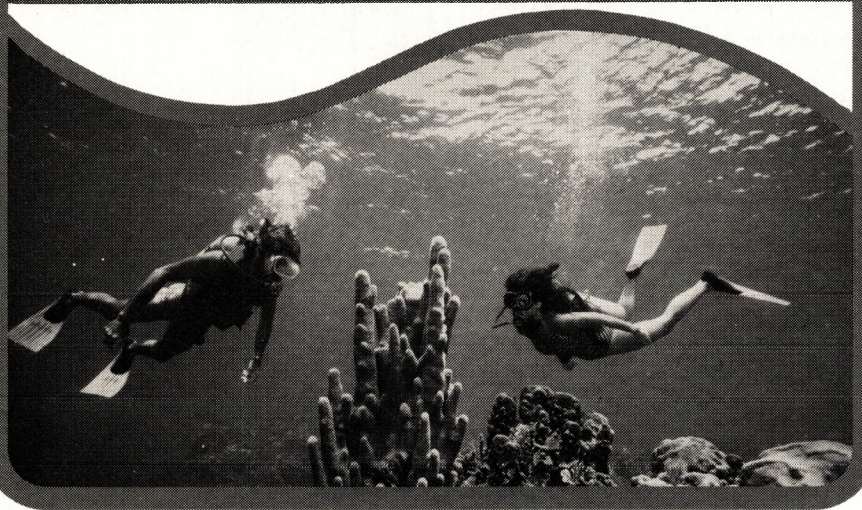
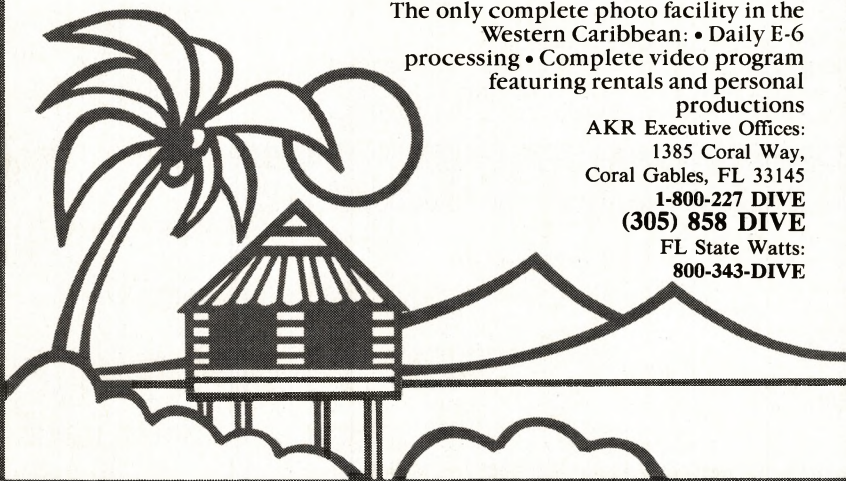
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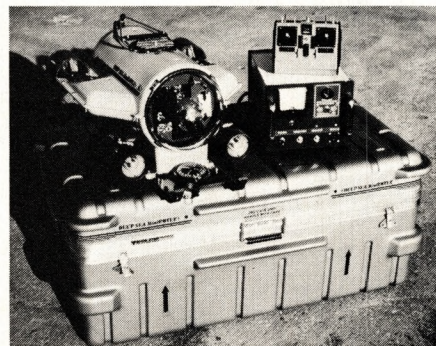
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PORTABLE SUB

and Shipbuilding of Japan, was also introduced at the ROV show in San Diego. Similar in configuration to MiniRover, although slightly larger and, at 2.4 knots, faster, it has a maximum operating depth of 330 feet and is priced at approximately \$27,000. The most interesting feature of the vehicle is its use of an optical fiber cable which, according to Mitsui, makes for superior TV transmission, as well as a higher data rate capability and greater



MiniRover with case and topside gear

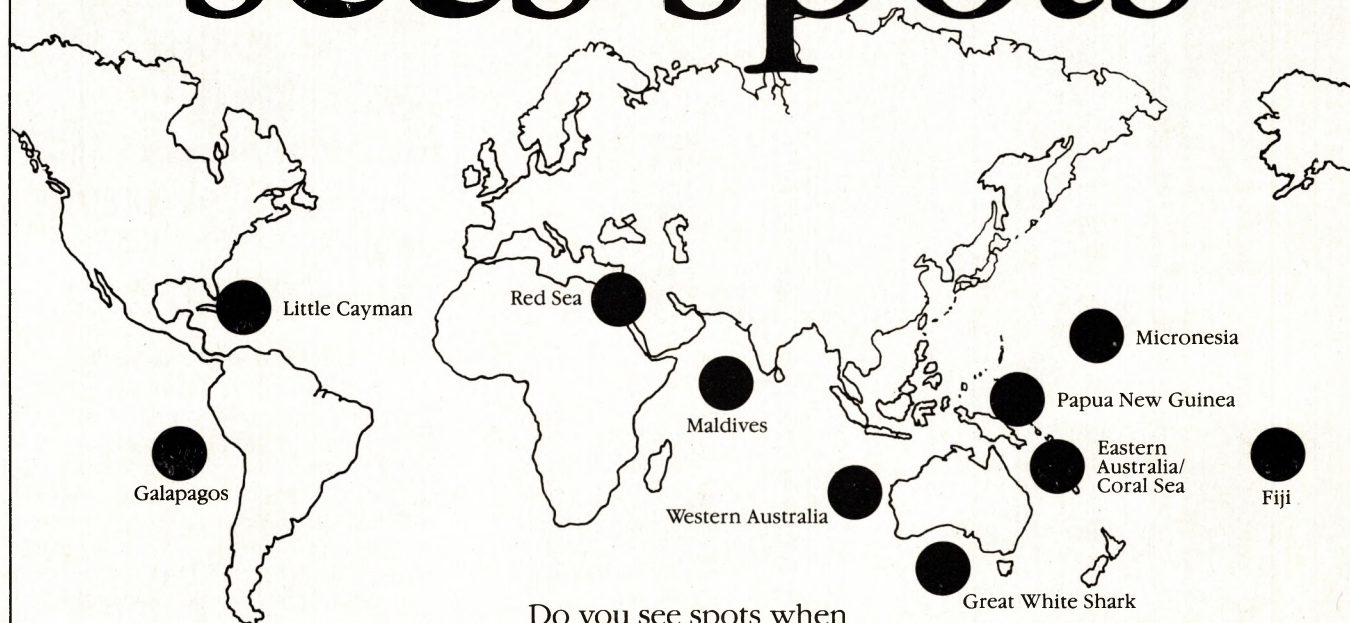
scope for attaching additional instrumentation. RTV-100 can be fitted with a lateral thruster as an optional extra; a manipulator and sonar are under study.

Low cost ROVs have already proven their worth. MiniRovers have surveyed icebergs off Greenland; inspected dams, sewer outfalls and ship hulls; gone hundreds of feet inside pipelines and run surveys in the icy waters of Antarctica. A Phantom belonging to Wolf Sub-Ocean of Toronto inspected 30,000 feet of pipeline in 12 hours. For the future, mine detection and neutralization for the military is likely to be a major application.

On the scientific side, low cost ROVs will open up new opportunities for marine biologists and others whose budgets do not permit the use of complex and expensive deep diving equipment. In recent tests in Monterey Bay, Phantom investigated seafloor tracks left by squid dredges and located the habitat of a species of crab that had been washing up on the beach in large numbers. In both cases depth would have precluded a survey by scuba divers.

Groups as diverse as police departments, treasure hunters and well-healed yacht owners represent an additional potential market. With the latter in mind, both Deep Ocean Engineering and Deep Sea Systems plan to introduce vehicles in the under \$10,000 range within the next two years. Nicholson is even talking about a "bargain-basement" ROV selling for \$2,500 for educational and recreational use. It could be just the thing for days when the water looks uninviting.

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Tennessee Pearls



photos/Armando Pellerano

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BY LOU ANN WOOD

Pig toe, washboard, three ridge, monkey face, butterfly, pimple-back—the freshwater mussels spilled from the catch sack into the flat-bottomed boat. The diver pulled off his hood, looked at the mussels heaped in milk crates and scattered across the bottom of the boat. "I must have \$200 worth of shells here. Not bad for the day's work."

Charles Funk of Camden, Tennessee was ending his day on the river. The sun dipped lower in the cloudless sky. The sharp outline of the woods along the shoreline was lost in a greenish haze. Charles picked up a metal ring and started sizing the shells he had emptied from the catch sack. He worked quickly, sorting by variety—washboards to the crate on the left, pig toes to the crate on the right. He pitched the undersized shells overboard. They sank—back in their home in the Tennessee River mud.

You might call this the heart of pearl country or waters. Here, in the Tennessee and Mississippi River Valleys, divers harvest mussels essential to the business of culturing pearls. Sixty to 65 percent of the mussel shells used in Japanese cultured pearls are supplied by the Tennessee Shell Company, Inc. of Camden.

These freshwater mussels are sought for their calcium carbonate composition and their thickness. They are harvested, graded, cleaned and sold to Japanese pearl farms. There, the shells are sliced and carved into beads. These beads, or nuclei, are implanted in pearl producing mussels, both freshwater and saltwater. The mussels secrete a substance called nacre that coats the nuclei irritants. When

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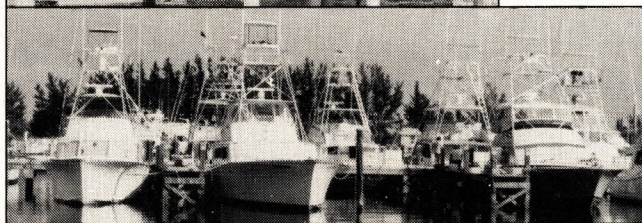
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TENNESSEE PEARLS

the nacre is deemed thick enough (at least over 0.2mm) the bead has become a cultured pearl.

For years the Japanese have dominated commercially cultured pearl technology and controlled the world's pearl market. However, if John Latendresse, entrepreneur, world authority on pearls and owner of the Tennessee Shell Company, Inc. and American Pearl Farms has his way, the U.S. will begin to compete with Japan soon. After years of detailed research, Latendresse successfully cultures his own pearls at farms in Kentucky, Texas and Louisiana. American Pearl Farms will start marketing its freshwater pearls in 1987.



John Latendresse watches as an assistant hauls up a basket of freshwater mussels.

The pearl industry's demand for freshwater mussels means a demand for divers. Harvesting mussels is a different type of diving and not without its risks. Mussels are found to depths of 90 feet. A dive is about 35 minutes to one hour, depending on the depth and the number of mussels in a bed. The diver crawls on the river bottom, feeling through mud for the ridges of the shells. He sizes them by feel as he fills a large burlap catch sack looped over his neck. When the sack is full, or the bed is worked through, the diver pulls himself and the shells up by a rope. A full sack of mussels can weigh as much as 60 pounds. Upon surfacing, the diver loops the catch sack over the rungs of the boat ladder and climbs aboard.

Some divers work with a tender in the boat to monitor the compressor and help grade the shells. Others use a buddy system of sorts and work the same mussel beds together. But many mussel divers prefer to work alone.

Charles Funk works to a maximum



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TENNESSEE PEARLS

depth of 45 feet. We found him diving in eight feet of water. That day, he had good visibility: He could see his hands in front of his face! "After 35 feet, all you see is black," Funk told us.

He wore a full wetsuit, including a hood. On his legs, from calf to thigh, were rubber leggings cut from tire tubes to protect his knees. In place of fins were running shoes. "I need shoes to dig my feet into the mud so I can move," said Charles. "I like to pull my boat with me." That's exactly what he did as we watched him dive for more mussels.

Charles uses a hookah system for his air supply. This is a regulator attached to a 55 foot hose, leading to a small oilless



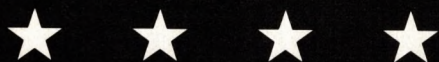
Top: Wire baskets of mussels are suspended from the lengths of white plastic tubing. Above: A freshwater mussel diver.

air compressor in the boat. A heavy rope, tied to the boat, runs the length of the hose. As Charles works the mussel beds, he tugs on the rope and the boat follows.

Charles is on the river by 9:00 am. When he is working a bed, he dives for mussels immediately; otherwise, he searches for another bed. He uses the rest interval between dives to size and sort the shells. Small varieties of mussels must be two and one-half inches. Large varieties of shells must be three and one-quarter inches. Charles dives until 4:00 or 5:00 pm. If he starts late, he stays late, as he did on the day we met him.

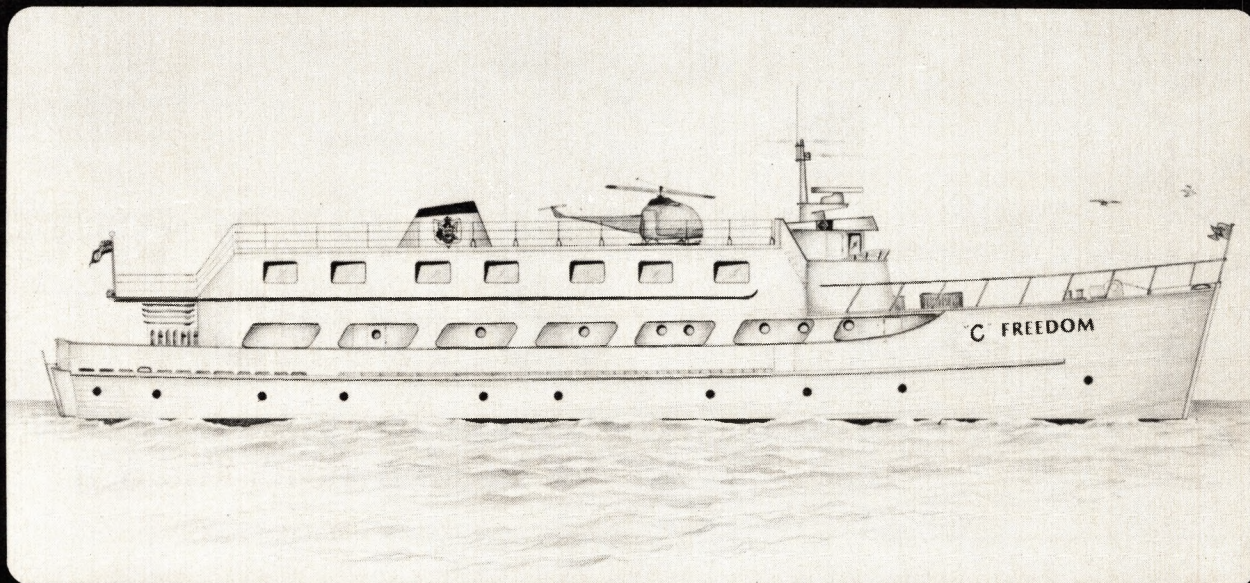
It's hard work for the diver. The season lasts only from June through October, but it's profitable. A diver can earn from \$200 to \$600 a day. Earnings vary with the quality of shells. John Latendresse employs 350 to 400 divers on independent contract each season. "A college student can work through a summer and make enough for a school year," he said. "All a diver needs is his own equipment and a boat. I can tell divers from any state east of the Rockies where to find mussels." >

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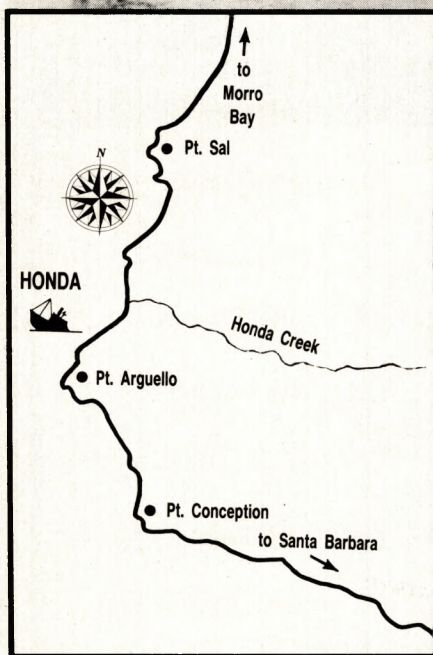
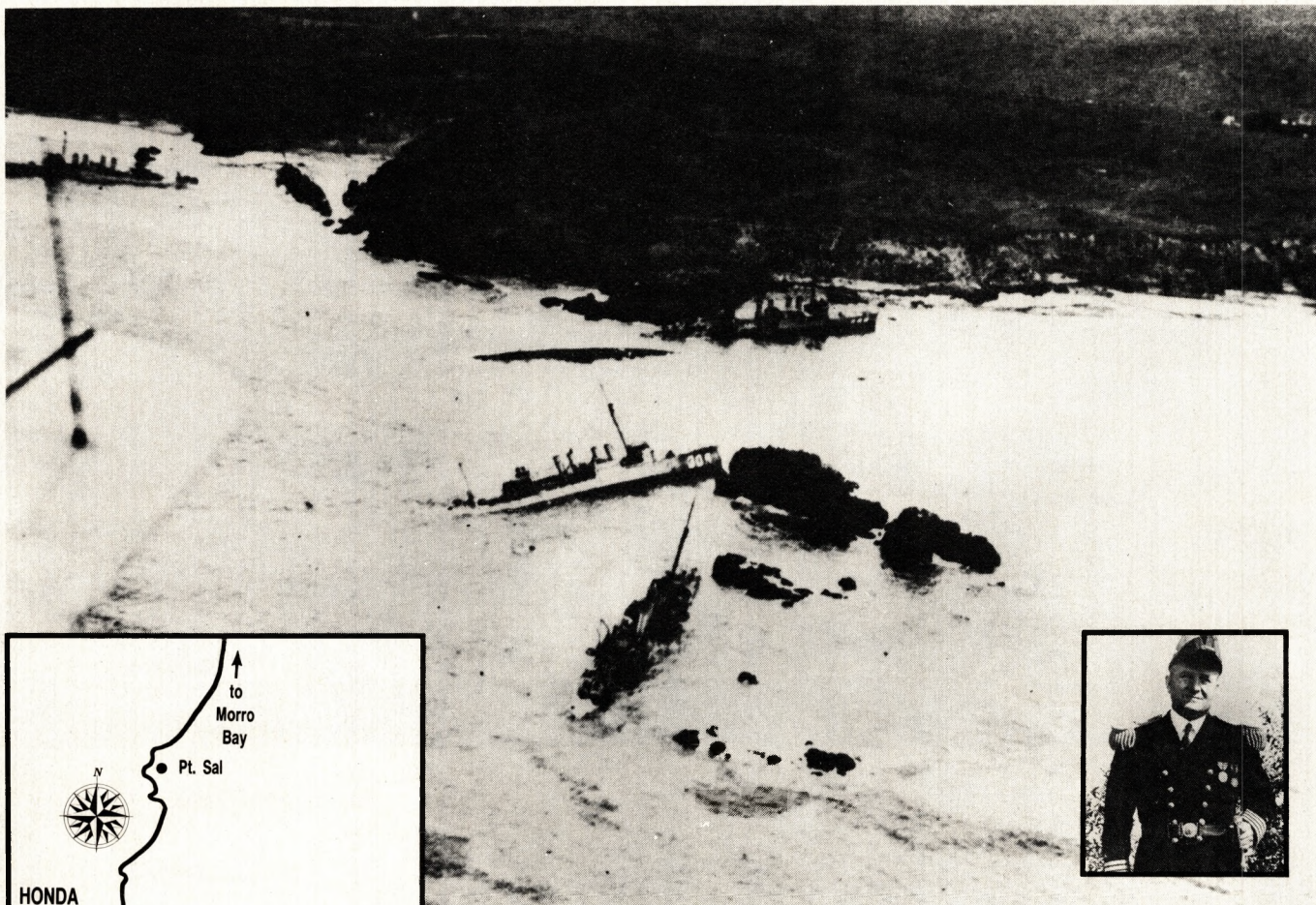
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CALIFORNIA WRECK DIVERS DO HONDA

Seven Destroyers "Attacked" By 45 CWD'S
After 61 Years Beneath The Sea

BY PETER JENSEN AND DAN PURDIE

The bar was full of California Wreck Divers who hadn't made the annual trip to a place reverently called Honda. As more strolled in, Jensen casually said to Purdie, "Wasn't it incredible, two full days diving Honda?"

Have you ever seen panic in a bar?

Honda, in this case, has nothing to do with motorcycles. It is a coastal area of Vandenberg Air Force Base named after a creek whose mouth is a few miles north of Point Arguello light, just northwest of Point Conception. It was at Honda, at 9:10 pm on September 8, 1923, that Destroyer Squadron 11, under the command of Captain Edward Watson, ran smack against jagged rocks. They were steaming at 20 knots on a southerly course from San Francisco to San Diego when an error in navigation left seven of 14 ships forever caught in a sailor's pur-

gatory. The seven destroyers, in order of their grounding, were the flagship *Delphy*, *Lee*, *Young*, *Woodbury*, *Nicholas*, *Fuller* and *Chauncy*.

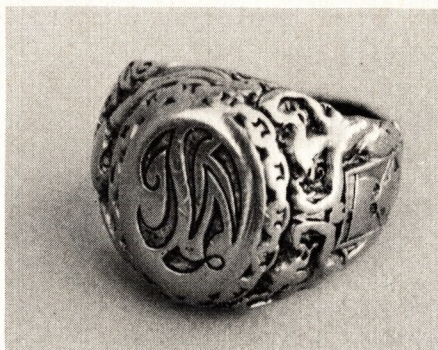
Twenty-three men lost their lives that night, three from the *Delphy* and 20 from the *Young*. Today all that remains is a monument overlooking the ocean, which conceals the rotting hulks of seven once proud, four pipe, flush deck destroyers.

Sixty-one years had passed when the dive boat *Conception* took a group of California Wreck Divers to Honda. Little did anyone know that the most incredible series of dives and finds in the club's 14 year history were about to commence. It was one of those bright, beautiful, crispy clear coastal mornings that only occur in California. The early morning sun silhouetted the launch towers at Vandenberg, suggesting them as 21st century mono-

liths erected to pay homage to the gods of space.

Against this background Roy Hauser, captain of the *Conception*, set his anchor snugly next to the *Fuller*. It's quite a sight to see 45 CWD members up at 7:00 am, but then it's also quite a sight to see divisible conditions at Honda.

After a safety briefing and orientation by divemistress Pat McFarren, the divers took to the water like a herd of stampeding ducks—fins everywhere! Divers frantically thrashed through the open ocean, racing one another toward Destroyer Rock where the *Fuller* and *Woodbury* sank. All knew this was the playground of the great white shark, but the divers had an appointment with destiny among the shattered ships in the depths below. Destiny immediately rewarded one early riser with a porthole frame.



photos/Bonnie J. Cardone

Inset left: W. Calhoun. Above: His ring.

Other morning discoveries from dives on the *Woodbury* and *Fuller* were gauges whose faces were worn smooth or disintegrated by the relentless actions of the sea as well as valve handles, a wire cage lamp and a boiler inspection port.

It is amazing to see the overwhelmingly destructive forces of the sea break down and reclaim man's ingenuity. To swim over the bottom, it is hard to imagine that what appears as a kaleidoscope of wreckage was once seven beautiful ships. The wrecks at Honda are nightmarish—smashed and ground down beyond recognition into the rock bottom. Usually, much careful effort is required to remove an impacted artifact from Neptune's concrete grip; this place has earned its nickname of Devil's Jaw. There are 11 shipwrecks on this one point.



Items from the wrecks at Honda. A soap dish from the *Fuller* tops bottom plaque.

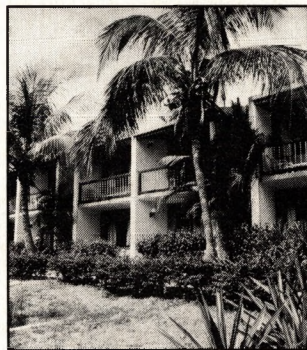
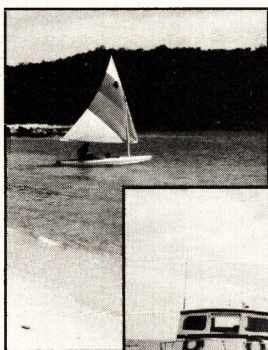
Even on this calm day divers could hear the constant thunder of waves overhead.

The air compressor onboard led to nonstop diving and a nonstop parade of artifacts. Divers marveled at finds such as speaker tubes, electrical boxes, shell

casings and valves, which, after a bit of tender loving care, were still functional.

At noon a strange thing happened: The ocean flattened out. This enabled the crew to relocate the *Conception* closer to shore, virtually over the *Young*.

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HONDA

The *Young* was the third ship in the squadron to ground, rolling over onto her starboard beam ends in less than 90 seconds, trapping many of her men. It was through the heroic leadership of Commander William Calhoun that most of the men were saved. He directed rescue operations in which portholes were smashed with fireaxes, releasing trapped crew members. The same smashed portholes provided ideal handholds to prevent the men from being swept to sea once outside the hull.

The *Young*'s remains rest in shallower and much less accessible water than the *Woodbury* and *Fuller*. There was 20 feet of water under the *Conception*, enabling spotters snorkeling on the surface to easily locate the wreckage.

Diving the *Young* is a unique and humbling experience. All the steel has rotted and eroded away, leaving only brass arti-



Calif. Wreck Divers with Honda artifacts.

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R E S O R T S

ROATAN/ BAY ISLANDS

facts shined to a high luster by the polishing action of the shifting sands. Items that would normally be considered a treasure on other wrecks were scarcely given a second glance. There was so much to choose from that divers often began working a find only to leave it for another. "Oh, the decisions life forces us to make. Should I work on the plaque or the porthole? No, I'd rather have the telegraph handles." This is exactly what Pat McFarren and Herb Miller did.

The telegraph handles were the most envied artifacts retrieved until a burly, quiet-spoken gentleman named Clif Craft climbed upon the swim step with an intact telegraph repeater.

Other goodies included silver cutlery and china, an unusual find in this shallow water where, on rough days, boulders the size of VWs bounce around, pulveriz-

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ing smaller items in their path.

All aboard were inspired by the aquarium-like conditions, a relic collector's dream come true. Water in this part of California is usually below 50°F, with one foot visibility the norm. However, divers were enjoying 68°F water with 25-30 feet of visibility.

The glow of shining brass on the bottom stretched to the horizon. Divers were nestled in a utopian womb, their minds spinning in the aura of sheer delirium, causing adrenalin-charged bodies to twitch with excitement.

As for fuel, people were foregoing the wonderful buffet, opting instead to cram sandwiches and Cokes down their gullets without removing any gear, not even fins or masks.

Honda's history of unpredictable weather and rapid condition changes kept all aware that every dive might be the last. It was with this in mind that Captain Hauser weighed the increasing current, wind swell and the late afternoon hour of 5:15 and decided to pull anchor for the day. This news was met with vocal



Dan Purdie with a restored porthole.

growls, but also with body language that read "thank you." *Conception* left for sheltered anchorage with a boatload of tired divers who were all snoring by 8:00 that night.

Dawn broke bright and golden, an omen of things to come. The ocean was flat. This, along with the sight of the previous day's brass littering the decks, created catalytic enthusiasm. We would have two consecutive days of diving Honda!

Not a second was wasted as the captain held everyone at bay until the anchor was safely set. Soon all was ready and club members were descending like Visigoths upon the wrecks.

First in the water was the current indicator (alias Jessie Roggen), who immediately returned to the boat with a perfectly intact Navy mug. Jessie had pulled the mug from a narrow gap between the

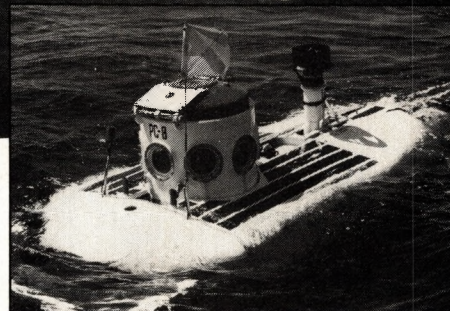
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HONDA

Fuller's boiler and a propeller shaft strut. It was nice to be reminded that no matter how destructive the sea is, it does exercise some discretion.

Following Jessie aboard was David Lee, grinning from ear to ear, sporting the prism and eyepiece of a gunsight telescope. Identification of the eyepiece was easy. Two years prior Jerry Bastian had found a complete gunsight, which was preserved in its brass storage tube.

Not to be outdone, Jerry came up with numerous beautiful steam pressure gauges from the Fuller's engine room area. Outdoing her husband, as usual, Mitzi Bastian swam 100 yards seaward to the wreck of the *Yankee Blade*, a gold rush paddlewheeler that sank in 1854.



Peter Jensen with gunsight telescope.

Mitzi returned with a rigging pulley and two handmade brass oiler box covers.

While others enjoyed a tasty Mexican-style lunch, the authors found the ship's clock from the *Young*, a handful of silverware from the *Woodbury* and a beautiful, ornate brass wire soap dish. Extracting the crushed soap dish from the matrix without damaging it required over two hours of work.

As the soap dish was being excavated, Dan Purdie found, to his surprise, just how lively unexploded ammunition can be, even after 61 years of immersion in salt water. As he used a rockpick to chip away some coal, a misguided swing resulted in striking a small arms round. The round protested with a very audible "pop," followed by dark bubbles shooting for the surface. These battered rounds still demand respect.

Hauser nearly had to pry divers from the water as he moved the 85 foot *Conception* to reanchor over the *Young*. The *Young* wasn't hard to find as conditions were better than the previous day and the polished propellers could be seen by anyone caring to glance over the *Conception's* handrail.

It was a dream come true—clear, shallow wreck diving in calm, warm seas. The five hours spent here found everyone in

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the water, except for brief interludes while empty tanks were exchanged for full ones. Evolution should never have removed this group's gills.

Great discretion was exercised by all since fatigue was beginning to shadow the second day of near nonstop diving.

A sword sheath found its way aboard. Shortly after, David Lee found a ceremonial sword handle with sharkskin and leather wrap still on the dolphin hilt.

More trophies from the briny deep included a large bridge porthole storm cover. Greg Elliot, the lucky finder, later etched onto it a photo depicting the 1923 sinking of the ship it was part of.

Enthusiasm peaked as Bill Wilson climbed aboard sporting two builder's plaques—one from the *Young's* condenser, the other from her boiler—both of which appeared sparkling new when cleaned with steel wool and fresh water.

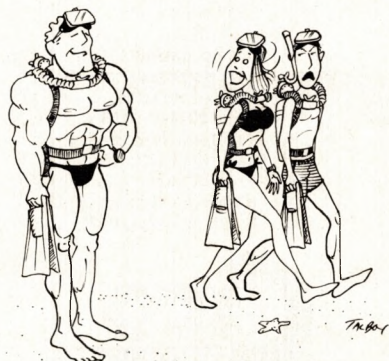
With only 45 minutes until the anchor



Early photo of W. Calhoun and shipmates.

was to be pulled and having just completed the eighth dive of the day, some people were strongly considering retiring. Then Dan was seen preparing for another dive and muttering, "This could be it, just might find the big one." And, find it he did. "The big one" turned out to be Commander William Calhoun's gold Anapolis ring. It was perfect. The inscription in the band read "United States Navy, William Lowdes Calhoun."

And so, the sun set, this time silhouetting a hand held high, clutching a pure gold ring defiantly before the monoliths. "Without knowledge of past, man is doomed to repeat his failures."

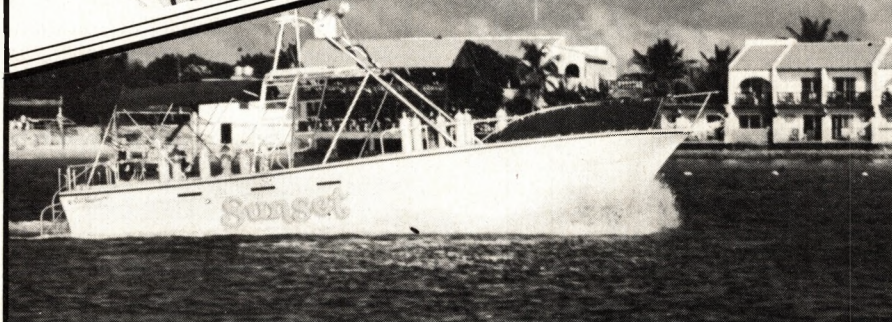


"I'll bet he has hemorrhoids."

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MEDICINE OF DIVING

Medical Seminars, Inc. will hold its annual Medicine of Diving program on Grand Cayman April 5-12, at the Holiday Inn. A complete diving program, under the direction of Ron Kipp of Bob Soto's Diving Limited, will be offered to physicians and their guests.

The academic staff will be highlighted by NASA astronaut William E. Thornton, M.D. and will include Alfred A. Bove, M.D., Ph.D., cardiologist at the Mayo Clinic. Dr. Bove is also the medical consultant for SKIN DIVER Magazine. Jefferson C. Davis, M.D., director of hyperbaric medicine at Southwest Texas Methodist Hospital in San Antonio, Texas will be the course director.

A special feature of the program will be Paul J. Tzimoulis, Vice President/Group Publisher of SKIN DIVER. He will host several evening presentations on his photo expeditions around the world.

For a brochure, contact: Medical Seminars, Inc., 11107 Wurzbach Road, One Elm Place—Suite 204, San Antonio, TX 78230; (512) 690-1005.

ST. CROIX DIVING ASSOCIATION

The mailing address of the St. Croix Diving Association, reported in January's SDM, was incorrect. The correct address is: P.O. Box 3483 Christiansted, St. Croix, U.S. Virgin Islands 00820. The telephone number for William E. Jowers, president of the association, is (809) 772-2099 or (809) 773-6822.

TRUK MYSTERY CARRIER

It has been 42 years since Truk Lagoon, heart of the former Japanese mandated islands and anchorage of the Japanese Imperial Navy's Combined Fourth Fleet, came under a rain of bombs from attacking American carriers in Admiral Marc Mitscher's Task Force 58.

More than 50 ships were sent to the bottom of the vast lagoon as a result of Operation Hailstone. Today the wrecks are seen only by divers.

However, at least one great mystery ship remains to be found, its precise location awaiting discovery by some adventurous diver.

William H. Stewart, author of the book, *Ghost Fleet of the Truk Lagoon*, researched the attack over a 13 year period in the historical archives of both the Japanese and American navies and found obscure references to a Japanese carrier that was attacked in the lagoon. The ship was seen by several American torpedo plane crews to have definitely taken two to three hits, one in the center of the flight deck. After the first strike, the flattop was never seen again on the many subsequent air raids at Truk, nor was it

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ever seen leaving the confines of the lagoon. It has never been found!

Trukese diver, Sisinio Willy, proprietor of the Ghost Fleet Dive Shop, has dedicated his efforts to locating the carrier and the remains of its crew. He has scheduled a series of expeditions to locate the mystery ship, believed to be somewhere off the southeast point of Moen Island. Anyone interested in these dives into history can write the dive shop at P.O. Box 295, Moen, Truk 96942.

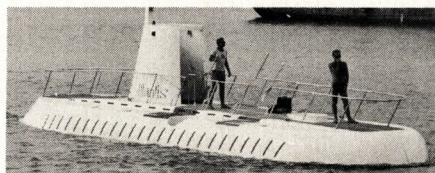
The book, chronicling the attack and its aftermath of horror, intrigue and deception, can be obtained from: Pictorial Histories, 713 S. Third West, Missoula, Montana 59801. 🐠

CAYMAN TOURIST SUB

A 28 passenger submarine, the *Atlantis*, is the latest tourist attraction on Grand Cayman. It offers trips to explore the undersea wonderland of this island's reefs and grottos.

The one hour underwater cruises take passengers through the Eden Rock area near downtown George Town. Up until now, only divers—and to a lesser extent, snorkelers—have been able to enjoy close looks at the abundant marine life and coral configurations for which the Cayman Islands are famed.

"Now the *Atlantis* opens up the under-



water world to everyone," says Barry Bellchambers, vice president of Sub Aquatics Development Corp., of Vancouver, Canada, which built the \$2.8 million sub over a period of three years.

Passengers sit back to back on the 50 foot *Atlantis* and look through large portholes. Though the sub is capable of diving to much greater depths—and will offer deeper dives to divers—its two man crew will keep it between 40 and 60 feet.

The 50 ton *Atlantis* is built of steel, aluminum and fiberglass, but it is buoyant, so that in the event of a power failure, it would rise automatically to the surface. It also has a 72 hour support system.

A dock has been built on the waterfront for the sub. It is close to the point on Hog Sty Bay where tenders bring in cruise ship passengers. 🐠

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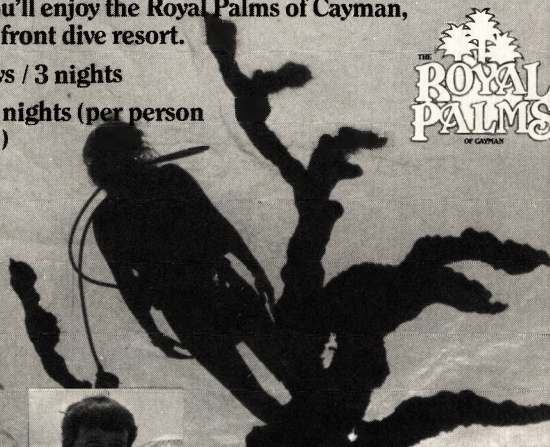
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The vessel will offer scheduled ten day cruises and can be chartered for cruises of any duration.

For further information contact See & Sea Travel, Inc. 680 Beach Street, San Francisco, CA 94109; (415) 771-0077 or call (800) DIV-XPRT.

DIVER MEDIC COURSE

The College of Oceaneering is conducting the practical phase of its Diver Medic Training Course (Course 240) at Northridge Hospital. This course was created to fill a need for qualified emergency medical personnel who have the specialized skills and knowledge to ensure immediate responsible medical assistance at the scene of a commercial diving accident or illness, until the evacuation of the victim or the arrival of a physician.

Northridge Hospital is the newest and largest non-military clinical hyperbaric facility in the United States. This facility, capable of treating 20 patients per dive, features a nine foot diameter, 32 foot long main chamber and a nine foot diameter by 15 foot critical care chamber.

The Diver Medic Course is approximately nine weeks long with the first portion devoted to independent study. Three of the final four weeks will be spent at Northridge Hospital, with the final week at the College of Oceaneering covering situations related specifically to the diving industry.

AQUA ADVENTURES PACKAGES

Aqua Adventures, the scuba tour operator, is offering a new series of scuba vacation packages this spring/summer. Packages are offered at 49 of the finest diving resorts in the Bahamas and the Caribbean and are in effect April 15 through December 15.

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For free brochures and reservations contact your travel agent, dive shop or Aqua Adventures, Inc., 318 Lexington Avenue, New York, NY 10016; telephone (212) 686-6210. 🌿

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Joe and Lynne Montedonico of Washington, D.C., are the owners of Bachelor's Beach Apartments on Bonaire. These offer one and two bedroom units that are large and built and furnished with top quality materials from the United States. Great diving is a few steps from the apartment patios. A shower is available for rinsing off after a dive, as is a freshwater tank for cleaning gear.



The Montedonicos have been diving Bonaire for more than 15 years. U/W photography is their mainstay, yet recently, collecting bottles and other U/W artifacts from the 14th and 15th centuries has been their main preoccupation.

For information contact: Bachelor's Beach Apartments, 4622 Charleston Terrace, Washington, D.C. 20009; telephone (202) 244-5046. 🌿

BRAC MEDICINE COURSE

A diving medicine course, sponsored by Dive-Med International, will be held on Cayman Brac May 2-10.

The program is designed to review diving emergencies and routine medical problems that most often face the physician at a Caribbean scuba resort.

The course has been approved by the Undersea Medical Society, Inc. for 25 AMA Continuing Medical Education, Category I, credits.

For registration and additional course information, please contact: Dive-Med International, The Gruehn Building, 3001 South Hanover Street, Baltimore, Maryland 21225; (301) 355-1903. 🌿

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BOTTLES



FROM THE SEA

PART 1: Recovery And Treatment

TEXT AND PHOTOGRAPHY
BY WILLIAM B. GILLIES

This is the first segment of a two part series on bottle diving. The final segment will appear in a subsequent issue.

Glass bottles are the lineal descendants of the amphora, olive jar and Rhenish stoneware jugs commonly called bellarmines. These vessels were probably not traded for their own sakes, but as containers for other commodities. Two characteristics make them important. They are fragile, but the pieces are remarkably resistant to destruction. These factors ensure that large quantities survive and that any changes in shape are reflected shortly after they were introduced because of the rapid turnover.

Bottles are represented on just about every ship wrecked in the western hemisphere since the middle of the 17th century. Often they or pieces of them may be the only visible items on a newly discovered site capable of providing a reasonably close date of sinking. Even their total absence can be informative by suggesting that the site pre-dates the time they were in use.

It had sometimes been the practice beginning in the 17th century to apply identifying seals to the bodies of wine and spirit bottles. Occasionally these seals bore a date. Chronology has been established by comparison with those and from other sources such as contemporary paintings and archaeological excavations. In this way the evolution of English bottles was worked out.

Of course, the dating of a wreck site

should not rely upon any single category or item, but should be derived from the entire artifact assemblage. The chief value of bottles lies in being able to initially estimate the age of a wreck so divers can form an opinion of its potential.

EFFECTS OF THE NEW ENVIRONMENT

When bottles are lost during a shipwreck they end up either covered with sand, entrapped in small pockets of sediment or encrusted by reef organisms. The same reef that ripped the bottom out of a ship can be responsible for the preservation of some of the most fragile items she carried. Paradoxically, a hard coral bottom is able to protect certain artifacts better than a soft, sandy one. Cylindrical bottles, for example, are often able to survive intact if deposited in a large sand hole, but the square case gins are rarely found whole in this situation. This is probably because they cannot stand up to the tumbling they get when tossed around by storm surges. On a reef, small objects fall into deep, narrow holes where they are sheltered from turbulence. In a short time they are encrusted and/or covered with sediments. This further shields them from mechanical injury.

The substrate upon which a bottle is deposited will have an effect upon the pH (acidity) of the attacking solutions. Where the sediments are finely textured and ox-

xygen becomes rapidly depleted, they are usually reducing and acidic owing to the activities of anaerobic microorganisms. Under these conditions the glass will be attacked, resulting in the formation of a weathering crust consisting of multiple layers of corrosion. The severity and extent of this process, called devitrification, is dependent upon the composition of the glass, the temperature and the time.

A different set of conditions prevail where there is coarser sand, which is likely to be oxidizing and slightly alkaline or neutral. This is less detrimental to glass, but it must be noted that a reducing environment would be established inside an intact bottle once the closure had been breached, admitting seawater and fine sediment particles regardless of what is happening on the outside. In this situation the corrosion would take place mainly in the interior rather than on both sides simultaneously, so the bottle is likely to be in better condition, all other things being equal.

In addition, there are other mechanisms of corrosion that are little understood. It is known from land excavations that glass is attacked by fungi in the soil and there seems to be no reason why a parallel could not exist in the sea, particularly in the presence of large masses of organic matter, such as ship timbers, known to be degraded by these organisms. There is also a silicon cycle in the

oceans that is seasonal. At certain times that element is deposited in the sediments and withdrawn at a later date. This might well have an effect upon glass.

If the wreck happens to be in a large sand hole where there is alternate covering and uncovering by storms, bottles can be colonized by filamentous algae during the periods of exposure and this may leave the surface pitted. Occasionally, a bottle will come to rest on the hard part of a reef in a high energy area, perhaps near a breaker. A place such as this is full of small caves and crevices among the corals. Here it will rapidly become cemented with coralline algae and eventually overgrown by a matrix consisting primarily of red coralline algae, the foraminifer *Homotrema rubrum*, bryozoans and the hydrozoan *Millepora alcicornis*. Although care must be taken during the excavation because of the fragile nature of a bottle, this type of recovery is remarkably easy. This is because there is a discontinuity between the encrustation and the artifact that can be exploited by directing a chisel to a point about an inch from the bottle and chipping away steadily. The crust will gradually fall away from the sound glass as work progresses.

A more difficult situation occurs when bottles are encrusted along with substantial pieces of iron such as cannon balls or large pieces of rigging. The metal causes electrochemical precipitation of calcare-

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BOTTLES

ous compounds and this, together with the subsequent cementation of skeletal debris, forms an extremely hard mass that is just about impossible to excavate without damaging delicate objects held within it. The only thing to do in this case is to remove the concretion in a large block and remove the contents by dissolving the calcareous matter with acid.

Harbors, bays and sounds, especially those in the vicinity of population centers, are often subjected to heavy ship traffic, sluggish tidal flushing and a wide variety of human pollutants. This can result in sediments with a high organic content that, in turn, leads to an increased level of microbiological activity. Because of these factors, bottles recovered from the muds of such areas are likely to be in poorer condition than those from the outer reefs. Once in a while these conditions will create a beautiful effect by gilding the glass with iridescent corrosion layers. This is likely to be lost if cleaning and treatment are carried out in the normal manner. The best method is to remove the water with alcohol and coat the glass with polyester resin as detailed in the following section.

ASSESSMENT AND TREATMENT

When a newly excavated bottle is presented for conservation the first consideration must be to estimate its strength and condition. If the glass is sound and there are no obvious weaknesses, attention can be given to removing sediments from the interior. This can be done by repeatedly filling the vessel with water and shaking vigorously while draining it. What remains should then be carefully loosened with a probe. More often than not there will be stubborn areas of compacted silt that give considerable trouble. These are usually at the bottom, but sometimes occur along the sides where they may even have eaten into the glass. Next, the entire bottle is submerged in a bath of dilute (0.2 percent) sulphuric acid. This will remove any light corrosion layers and superficial encrustations from the outside and, given enough time and with the assistance of the probe, will also loosen those troublesome areas.

If in a more advanced state of deterioration, the glass has probably broken down into multiple corrosion layers. Often, when freshly excavated, it will appear to be in good condition, but within a short time will begin to show signs of its true state. The depth to which this has penetrated the glass will determine what form of treatment should be applied. If it is extensive, the glass will have lost much of its strength and must therefore be desiccated and coated with resin. It is imperative that no dilute sulphuric acid be used

because in these circumstances the glass will disintegrate.

The removal of water is accomplished with alcohol, starting with a bath of 40 percent through 60 percent to full strength. A good quality commercial grade of methylated spirits or denatured alcohol will do, but the tinted preparations are to be avoided since they have a tendency to impart unnatural colors to the finished product.

If the glass has so rotted there is danger of disintegration before the plastic can be applied, a different procedure must be used. The problem here is that the resin cannot be successfully bonded to a wet surface, but the glass will crumble to dust during the drying process. It is difficult to imagine how any bottle that has reached this state could be recovered intact. However, experience has shown that for a variety of reasons corrosion of glass is not uniform, so a sufficient number of large pieces might survive to provide enough information to warrant an attempt at reconstruction. When the pieces are removed from the final bath of alcohol all surfaces can be brushed with a 2.0 percent solution of soluble nylon in alcohol or better still, soaked for 24 hours in that solution. The nylon will hold the layers together until polyester resin can be applied. An alternative is to use acetone as the desiccating agent and then coat with polyester resin.

RESTORATION AND RECONSTRUCTION

Although bottles sometimes survive the violence of a shipwreck, a large percentage are broken and are represented only by shards. The heavy bases are the most frequently encountered recognizable parts. Next come the necks and lips. These can provide dating information especially if both are present, but if heavily eroded there is little hope of matching them. Additional information can occasionally be gained in the absence of intact specimens by reassembling broken pieces whenever possible. The best chance for restoration comes when a shattered bottle is found in a confined space where the majority of the pieces will be available and the broken edges sharp, because of the reduced chance of erosion. Others occur when a bottle is broken during excavation or when there is only superficial damage such as a missing neck or a hole in the shoulder.

MATERIALS

Polyester resin is one of the most versatile materials in conservation. It is of particular value when work is being done on glass. There are several types available and these can be adapted to specific purposes. The ordinary commercial grade is used to reinforce bonds, for casting small pieces, for saturating fiberglass cloth and to provide a backing for holes. There are fillers on the market for



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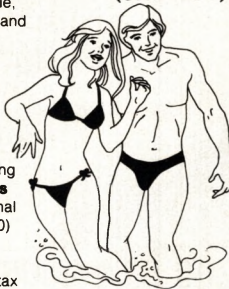
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BOTTLES

thickening the resin, but some of these contain asbestos and are therefore not recommended because of the subsequent sanding that will be required and the hazard of inhaling the dust. Gel paste has the consistency of petroleum jelly, contains no asbestos and does not run to any great extent. Casting resin is a clear and colorless product of special value in mending transparent or translucent pieces. There is also a finishing resin that contains wax.

Matching is done with pigments and dyes. Pigments give an opaque finish that is good for working with black glass. Sometimes no effort need be made to conceal the work. When this is the case, black seems to be the most pleasing color for the repairs. Dyes are transparent and are useful on thin or clear glass. This is the most difficult sort of work because sometimes the hardener will cause the carefully matched colors to alter. This can be avoided to some extent by working with larger batches than required. Thus the ratio of hardener to resin will be smaller and the unwanted effects lessened. Fiberglass cloth is used for bridging gaps and building up necks. It is dipped in resin, applied to the inside of the vessel and allowed to harden. The area is then filled with colored gel paste to the thickness of the glass. Detailed work requires a close weave of cloth. This is available at hobby shops and resembles a thin gauze.

TOOLS

- (1) Cyanoacrylate—A contact adhesive for the initial assembly of pieces. It needs no clamping but should be reinforced.
- (2) Plasticene—For taking impressions and to use as a back for the filling of small holes.
- (3) Liquid Rubber—Painted on in layers to build a mold. It dries in the air.
- (4) Probe—Made from a wire coat hanger. Used for removing sediments and for angling the fiberglass cloth into position inside a bottle.
- (5) High Speed Tool—For cutting, grinding, polishing, etc.
- (6) Sandpaper—Various grades. Finish with emery paper.
- (7) Mineral Oil—For finishing.

TECHNIQUES

Many times a bottle will be found with the neck and lip broken off. These can be restored by building up the neck with fiberglass cloth dipped in resin and rolled to fit inside the break. When this has set, polyester gel paste is applied to the outside to build up the contours and then sanded smooth. The lip is fashioned by

making a mold with the liquid rubber from an intact and similar bottle or a broken piece from the same site. A new lip is cast from this and applied to the newly constructed neck. Gel paste fills in the crevices and is sanded.

A piece may be missing from the shoulder of an otherwise intact bottle. This can be repaired by angling a piece of fiberglass cloth previously dipped in resin across the inside of the gap using a probe fashioned from a wire coat hanger. Once this has hardened, gel paste can be applied to the area, which is then sanded and finished.

The most satisfying exercise is to gather up the pieces of a completely shattered bottle and reassemble them. This is so difficult and time consuming that it is only practical to attempt in special cases. The secret of success is the contact adhesive cyanoacrylate. This does away with tedious sand bags, adhesive tape and other supportive measures. In this way the vessel is gradually rebuilt piece by piece and reinforced with resin and cloth where necessary as the work proceeds. There are always pieces missing and these are provided by bridging the gaps with fiberglass cloth or casting the required pieces as described above. When filling large areas, a contour gauge will be a great help in establishing the curvature of a missing section.

FINISHING

This is what might be termed the cosmetic part of conservation. It is important because no matter how much skill and hard work have gone before, if the finished product is not natural looking and attractive the effect will be disappointing. The repaired bottle will now consist of two dissimilar substances, the original glass and the parts that have been replaced by plastic. These do not reflect light in the same way, so discontinuities can be readily seen. A final sanding should be given with a fine grade of emery paper and an electric sander. The effect of this is to melt the surface of the resin to give it a glass-like sheen. However, at the same time it frosts the glass parts and dulls them. A coating of polyester resin will render the glass translucent and has the further advantage of imparting the same reflective properties to the whole bottle. This will make the overall appearance more pleasing, but will not mask the difference unless the plastic is carefully colored to match the glass. Be sure to use the special finishing resin that contains wax for the final coat. The wax rises to the surface during the curing process to ensure the surface does not remain tacky. Labels have to be read carefully to spot this product. If the effect of this coat is unnaturally glossy, it can be toned down by rubbing with a mild abrasive such as the rubbing compounds used on automobiles. A good finish can also be achieved by applying a small amount of mineral oil to the surface.

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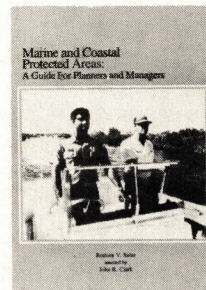
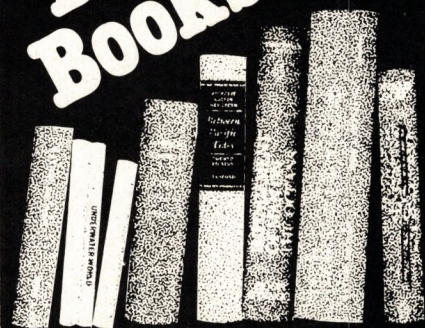
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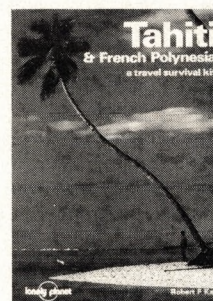
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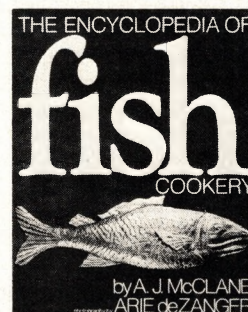
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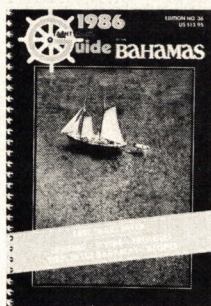
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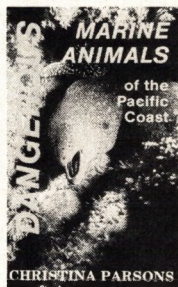
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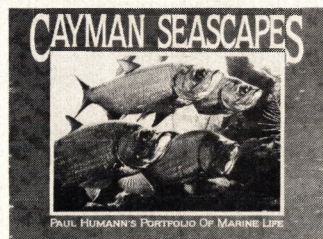
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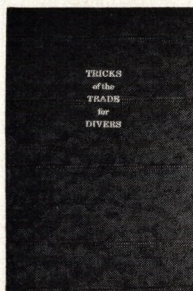
1986 Yachtsman's Guide to the Bahamas—Including black and white photos, maps and diagrams, this guide provides everything the yachtsman needs to know to prepare for a Bahamas cruise. \$13.95. Tropic Isle Publishers, P.O. Box 610935, North Miami, Florida 33161.



Dangerous Marine Animals of the Pacific Coast—By Christina Parsons, this handbook describes the appearance and habits of a variety of potentially dangerous invertebrates and fish. First aid is included. \$4.95. Sea Challengers, 4 Sommerset Rise, Monterey, CA 93940.



Cayman Seascapes—This book is a collection of Paul Humann's beautiful underwater photos of marine life, reproduced in full color on high quality paper stock. \$26 hard cover, \$20 soft, plus \$2.50 shipping. New World Pub., 1861 Cornell Road, Jacksonville, FL 32207.



Tricks of the Trade for Divers—This book by John M. Malatich and Wayne C. Tucker describes techniques utilized by commercial divers for U/W work. Photos and diagrams illustrate each procedure. \$22.50. Cornell Maritime Press, Inc., P.O. Box 456, Centreville, MD 21617.

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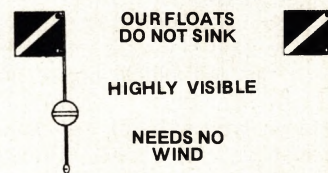
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Technifacts

BY E.R. CROSS



In Technifacts for March 1985, I discussed an exciting trip across Washington, into northern Idaho and then back across Oregon to the Pacific Coast. The principal reason for this trip was to explore the environments of rivers, the effect dams had on the rivers, and the impact people had on these bodies of water. I also wondered about the activities of sport divers in these waters.

Three of the rivers visited in the 1984 trip were the Minam, the John Day and the Grande Ronde, all in northeastern Oregon. In August 1985, I revisited the Grande Ronde, a wilderness-type stream for most of its turbulent route from the headwaters at Lake Grande Ronde in the center of the Blue Mountain range to its confluence with the mighty Snake River south of Lewiston, Idaho.

Wilderness-type streams are usually fairly shallow and mostly swift. Because of this they are not inviting dive sites for

most sport divers. But there is an abundance of aquatic life in these streams and they can be an enjoyable experience for a sport diver.

My way of enjoying the quietest sections of these rivers is to don a mask, snorkel, fins and, of course, a wetsuit. Most such rivers are snow fed and are dangerously cold unless the diver is insulated. Once in the water I make a "float dive" downstream, sometimes in water only elbow deep; sometimes diving deeper in the clear, slow moving pools above rapids.

I chose to revisit the Grande Ronde because of familiarity with the river based on dozens of visits over the past 50 years. I was also interested in possible changes in the water quality and wanted to take a closer look at some areas.

From its headwaters the river flows in a generally northeasterly direction. For the first 35 miles or so it is truly in a wil-

derness area with only an occasional area cleared by a settler. In the area of La Grande the river meanders through the Grande Ronde Valley where it is used for irrigation. Here the flow decreases during the summer months. Houses and farm buildings border the river banks.

Thirty river miles downstream from La Grande, the Grande Ronde River flows through the outskirts of Elgin, a pretty, bustling, mill town of 1,600 or so inhabitants. Downstream from Elgin the river is again in a wilderness area and is fed by numerous creeks and rivers. The combined flow of the Minam and Wallowa rivers empty into the Grande Ronde a few miles downstream from the abandoned logging town of Looking Glass; the Mud and Wenaha rivers join the waters just upstream of Troy, Oregon. Some 40 more meandering miles across Oregon and into the southeastermost corner of Washington, the Grande Ronde is lost in

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the sweeping waters of the Snake and is on its way to the Pacific Ocean, nearly a thousand river miles away.

Most rivers such as the Grande Ronde are affected by several water quality issues. One of these is diversion of stream water. This may decrease stream flow and affect downstream uses and water quality that can, in turn, affect aquatic habitats. Increased water temperatures may result from low flow rates and interfere with rearing and production of salmonoid fishes. Stream bank erosion is often accelerated by the activities of man, particularly the removal of soil-holding plants. Poor control of logged areas lets brush, logs and slash wash into the streams and interfere with the natural migration of aquatic species. Low flow, higher temperatures and high nutrient concentrations (from runoff from farms, seepage from sewage treatment plants and possibly septic systems from near-shore residential areas) may interfere with irrigation, fish rearing and recreational uses.

Oregon has one of the most comprehensive land-use laws in the nation. These laws have addressed water quality issues and have acted to maintain and improve the quality of all the State waters. Regulations have been issued for minimum flows for most streams to preserve fish and other habitats.

I made float dives in a quiet section of

the Grande Ronde River that has been used as the "ol' swimmin' hole" by generations of La Grande kids. I also floated just downstream from Elgin, at the Looking Glass area and at the confluence of the Minam and Grande Ronde rivers. The only stream degradation of note seemed to be an excess of algae forms in the sections of the river downstream from La Grande, where the river is slow moving through areas of farms and home sites. The balance of the river was sparkling clean in the rapids and clear in the deeper pools. Raft tours of the lower Grande Ronde are conducted from Elgin, usually in the spring and early summer during the periods of higher water.

Perhaps because of the difficulty of adaptation to an aquatic life in fast flowing streams, most of the life forms found in the Grande Ronde were particularly interesting and, in some cases, perplexing. Probably the most abundant life forms I saw during these dives were the hellgrammites. These crustacean-appearing animals live inside a tube-like structure made from small stones cemented together. The tubes have openings at the larger end, out of which the head and some appendages are seen as the animal crawls across the bottom. The unusual thing about hellgrammites is they are the aquatic larvae of the dobsonfly. Local fishermen sometimes use them for bait for several fish species.

A number of fish can be seen, mostly in the quiet, deeper pools of the river. Trout, of course, are present as are an occasional smallmouth bass. In the creeks and small ponds that feed into the river, carp, catfish and other "trash fish" are found. Historically, salmon runs occurred in the Grande Ronde but not in recent years. The State Fish and Game Department is currently working to reestablish salmon in the river.

Another abundant creature in the river is the clam. There are at least three species collected, although not in the abundance of 20 years ago. However, those that are found are more abundant in shallow water than in the deeper pools. I was unable to find a name for any of these bivalves. Two appear to be shells in the family Unionidae. Possibly both are genus *Anodonta*. The larger shell may be *A. imbecilis* while the smaller of the two is possibly *A. imbecilis*. If a Technifacts reader can help identify these shells it would be appreciated.

As a note of interest, it is little wonder that shells in the family Unionidae, and particularly in *Anodonta*, are hard to identify when considering that one shell, *Anodonta cygneus*, has received more than 500 different names. One other has received more than 100 names.

An unusual and interesting feature of these shells is their peculiar reproductive process. Like most mollusks, this family



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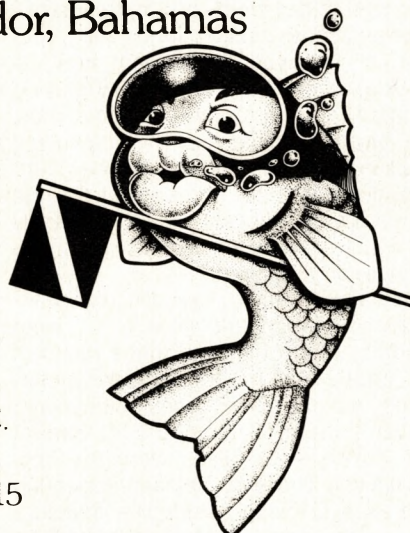
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TECHNIFACTS

hatches from eggs, but the *Anodonta* do not immediately become adults. They first are larval forms called glochidia. These must attach themselves to the skin, fins, or, usually, gills of fish, where they undergo a period of parasitic existence. In this stage they are transported into any body of water the host fish can reach. Also in this period the anatomy is metamorphosed and the young bivalve drops to the bottom and develops into maturity.

Other bivalves found in the Grande Ronde River, as well as in most rivers



Mussels from the Grande Ronde—possibly *A. imbecilis* (smaller) and *A. implicata*.

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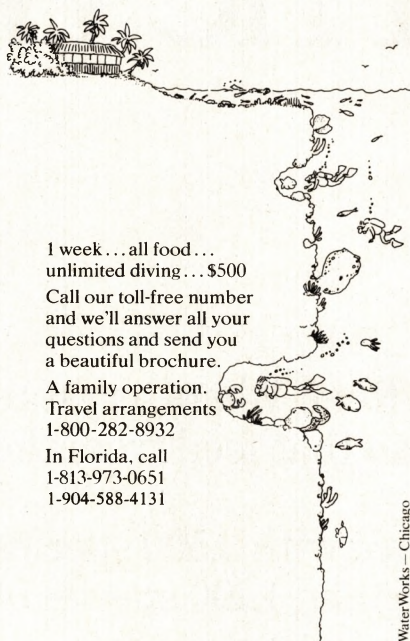
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and lakes in the Western states are in the genus *Margaritifera* (pearl shell mussel). A third genera, with only a single species, *Gonidea angulata*, is found in rivers of the West Coast states.

Most of my 50 years as a military, commercial and sport diver have been spent in the oceans of the world. But, like the king salmon, I must occasionally return to the wilderness headwaters of streams for a revitalization of spirit and a renewal of the promise of an eternal spring that only the quiet and serenity of a great wilderness area can provide. Float dives in these streams are a bonus that only sport divers can enjoy. But a word of caution: A wilderness area, and particularly a wilderness stream, is very sensitive to the impact of man. Accept these areas and their rivers for what they are—environmental treasures that need to be cared for as well as enjoyed.

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SEA-HORSE 30

(Continued from Page 51)

tighter seal. As a result, only two rings, rather than the usual three, are used on each cylinder. It is claimed there is less wear on the cylinder walls.

Johnson has taken many steps toward corrosion prevention. They coat the engine with special multi-layer paints and attach replaceable zinc anodes. However, service managers remind me that the best corrosion prevention comes from flushing the engine thoroughly with fresh water after use in seawater.

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KEYS PACKAGE

The price quoted in the ad on page 122 in our March issue was incorrect. The Dive the Best of the Keys package price is \$120. For more information call toll free: (800) 634-3935; in Florida (800) 821-9155.

We regret any inconvenience this may have caused our readers.



DIVE Papua New Guinea

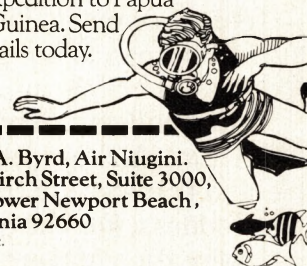
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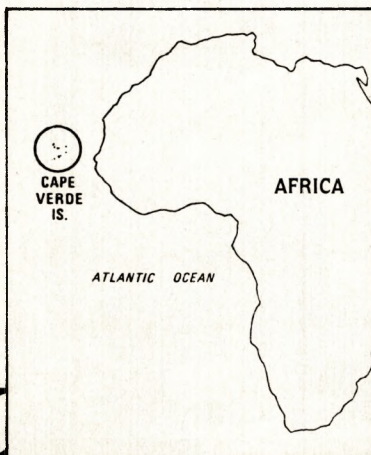
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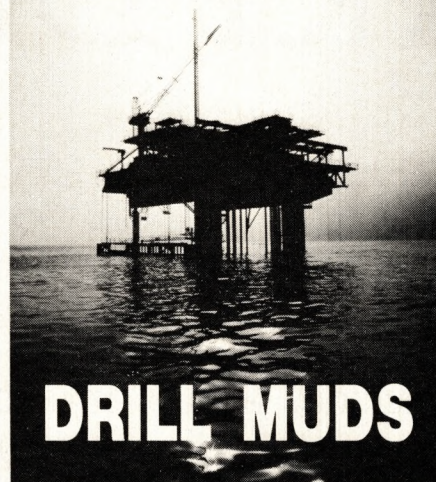
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GETTING TO THE BOTTOM OF



DRILL MUDS

Is California's Santa Barbara Channel Threatened?

BY HILLARY HAUSER

In the year 2001, divers exploring the water of the Santa Barbara Channel may not find lobsters, crabs and abalone, but millions of worms living on the bottom and the fish taken from offshore waters may be hazardous to eat.

Or, they'll find the channel alive and healthy—with fishes, lobsters and crabs congregating around an increased population of offshore oil platforms that function as artificial reefs.

These two radically contrasting scenarios are—at the moment—imaginary, but depending to whom you talk, either one is possible in the future.

At the center of these diverse possibilities is an estimated 900,000 tons of toxic wastes, known as drilling muds, that will be dumped by oil companies (somewhere) during the next 16 years as they expand their operations in the channel.

The drilling mud controversy is reheating as public hearings approach in which the state Lands Commission considers oil company plans to drill along the coast.

Currently, the law requires oil companies to haul used drilling muds to Casma, a toxic waste dump—unless they receive a permit to dump them at sea. This is expensive for the industry, which has already received a general permit to dump drilling mud in federal waters (beyond three miles).

But, as oil operations expand in near-shore areas, the industry is seeking a general permit to dump in state waters as well (the Santa Barbara Channel). At present, each company must get its dumping permit on a case by case (hearing) basis.

Drilling mud (more correctly called

drilling fluid, since it doesn't resemble the mud one finds in one's backyard), is a clay-based (barite) fluid used to lubricate the drill bit, circulate the drill cuttings to the surface, help seal the well wall and control pressure in the well.

Lubricants and other substances are added to the mud to suit the conditions of each drilling operation, and in these, there is a long list of highly toxic metals and chemicals—including arsenic, cadmium, chromium and mercury.

Oil company spokesmen say these substances are "found in nature" and are harmless when dumped at sea. They have funded studies, used in environmental impact reports (EIRs) and included in hearing procedures.

These studies are as controversial as the mud itself. Depending on who does the studies, the findings are, apparently, quite different.

The oil companies have been funding expensive studies for a number of years



Photos/Bob Evans

Hillary Hauser observes a cabezon as it perches on lush marine growth encrusting the supports of a drilling platform.

that imply the waters off Santa Barbara can withstand the dumping of drilling mud. Essentially, these studies indicate there is reparable damage in the immediate area—poisoning and smothering.

But this damage is temporary, say the studies, and marine animals are said to quickly recolonize. Most of the muds drift down current in what is called a plume, and the offensive elements are dispersed in such a way they are not hazardous to marine life.

But there are those who disagree with these findings and feel that industry-funded studies are not to be trusted. In 1982, an advisory panel to the California Regional Water Quality Control Board was formed to advise the board on matters of mud dumping before it issues permits. Called the Oceanographic Technical Advisory Committee (OTAC), the three member panel was also asked to

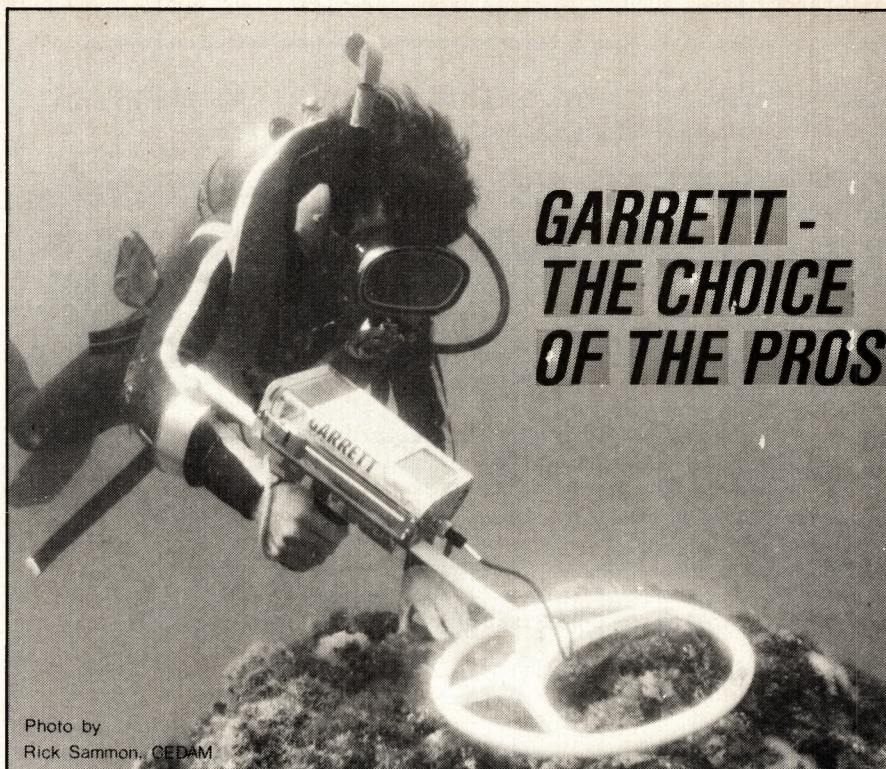


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DRILLING MUD

formulate a plan by which all drilling mud studies will be conducted. (This group was subsequently renamed Oceanographic Technical Assistance Panel, or OTAP.) By any name, the group has yet to finalize a plan for drill mud study.

One OTAP member, Jim Steel of the state Department of Fish and Game, cited a number of problems in coming up with a satisfactory study plan. One problem, he said, is that no data exists on the condition of marine life in the area before oil drilling began. "Also, you have variations in animal populations," Steel said. "You don't know whether you're looking at the impact of the substance on the animal, or



A Cancer crab burrows into drill mud discharge on the seafloor. Empty barnacles and mussel shells have been pushed aside. Sea cucumbers patrol the area.

something that's wrong with the animal before. We're trying to find out the right way to monitor these things." He estimated it will take five years for OTAP to get its testing and monitoring programs in place. He also said that the majority of drilling mud studies that now exist have been done primarily by oil companies—at a cost of \$35 million. Non-industry, however, has done very little in the way of qualified testing, he said.

These statements, however, exclude one study done by Dr. Daniel Morse, a professor of molecular genetics and biochemistry at UCSB. He is well known in the marine world for important discoveries he has made in abalone mariculture. Morse's findings in any area of the marine sciences are not sniffed at. Last fall, he and his research staff did their own study on drilling mud in his saltwater laboratory at UCSB, putting various concentrations of mud components with larval abalone. What he discovered has alarmed him. "Typically, adult animals and plants exposed (to drill mud) for a short amount of time will probably live," said Morse. "But more important is the

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very critical life cycle stage of marine animals that depend on settling of the very young larvae to grow into adults."

Larval animals drift in the plankton currents until they receive a chemical triggering that signals them to settle, or drop from the currents, at which point they attach themselves to a reef. Larval abalones, for example, receive a chemical signal from the algae they feed on, which triggers them to drop. If they settle in an unsuitable (non-algae) habitat, they die and if they don't settle at all, they die. Drilling muds completely block this normal chemical triggering, Morse said.

Because of this, entire generations of abalone, lobster, mussels, scallops—as well as other important marine animals that now make up the California fisheries—could fail to materialize, he said. "What they don't tell you is that the sea life that survives where drilling muds have been dumped are worms and things of that nature," said Morse. "Hundreds of different worms could be described as a 'rich biological community,' but is that what society wants?"

Morse said the unlimited disposal of drilling mud in the Santa Barbara Channel will eradicate the marine science programs of research and teaching that emanate out of UCSB—something that alarms him as much as the loss of major fisheries in the area.

Morse's determinations are similar to the findings of another independent study issued by the National Research Council of the National Academy of Sciences in Washington, D.C. Both studies address the issue of the ability of larval marine life to survive in an ocean where drilling mud has been dumped.

Morse said he was prompted to do his own study because almost every study he had reviewed had completely ignored the larval development of marine animals. Because of this and other scientific factors, he found 95 percent of the studies to be completely in error. "They missed or underestimated the effects of the toxic wastes in drilling muds by a thousand-fold," he said.

Pointing to the recent discoveries of toxicity found in fishes from Santa Monica and San Pedro bays, and to the Love Canal and Stringfellow disasters, Morse said he is skeptical of assurances from industrial producers who state their methods of toxic waste disposal are safe. "These assurances are made with absolutely no basis in fact and these things are coming back to haunt us," he said. "What we face when we've learned of the magnitude of these mistakes is that the available data is shockingly incomplete. These studies are appropriate, but are repeatedly copied and recopied and included in EIR after EIR. If they are traced back, they rest on anecdotal evidence, most of which was funded by the producers of the toxic wastes."

Steel said that OTAP has learned of
(Continued on Page 134)

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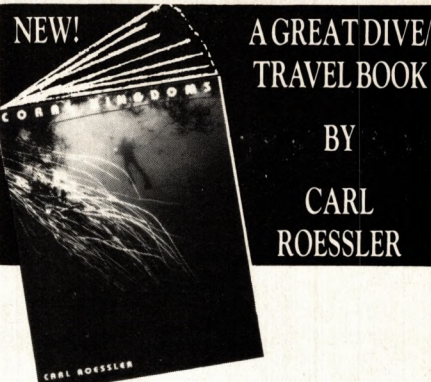
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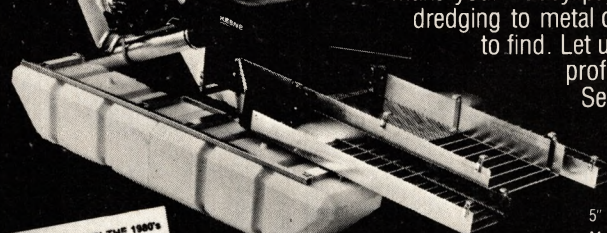
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Nikonos' introduction of the SB-102 strobe should be considered a major turning point in the advancement of underwater photography: It includes one of the most advanced metering systems in the world—TTL (Through-The-Lens). This makes underwater photography easier than ever; TTL lets the photographer devote precious time to locating and composing pictures without the hassle of calculating exposures.

The largest component of the SB-102 system is the strobe head itself. Its bright orange body and black trim make an impressive package. On the top is a multi-function panel that controls all operations. The back of the strobe is O-ring sealed and removable for easy battery access. It utilizes a unique latching system, incorporating safety devices, to prevent accidental opening underwater. On the back of this panel is a flash exposure calculation dial especially designed for the Nikonos III, IV-A or V cameras. The base of the strobe has a collar that allows easy connection to the flash arm. The synch and sensor sockets are also found here. Both have their own O-ring sealed caps that allow the strobe to be watertight even without any cords. The front of the strobe has a large dome port that accepts the wide angle flash adapter. This widens the angle of coverage for use with a 15mm lens. The adapter has a hole in the center so the target light can be used.

The synch cord that comes with the SB-102 is Nikonos' best design yet. This five wire cord can be totally disconnected from the flash and has its own dust covers for storage. Each end has a heavy duty locking ring to prevent damage. But, if the cord becomes damaged, only it has to be sent in for repair. The cord has a right angle turn, allowing the camera to be set down on its base without damaging the cord.

The camera bracket has holes for the Nikonos III, IV-A and V. On one end of the bracket is a slot and two registration pins, allowing the strobe arm to be mounted in two different directions. The arm has a hand grip, making it easy to hold even while wearing gloves, and a knurled knob at the base, making it easy to attach the camera bracket. The top of the arm is angled so the strobe can be positioned both over the camera for close-ups and angled away from the camera for wide angle shots.

One final component of the system is the flash joint. This slides onto the arm and attaches to the strobe head. It allows 360 degree movement of the flash for total lighting control.

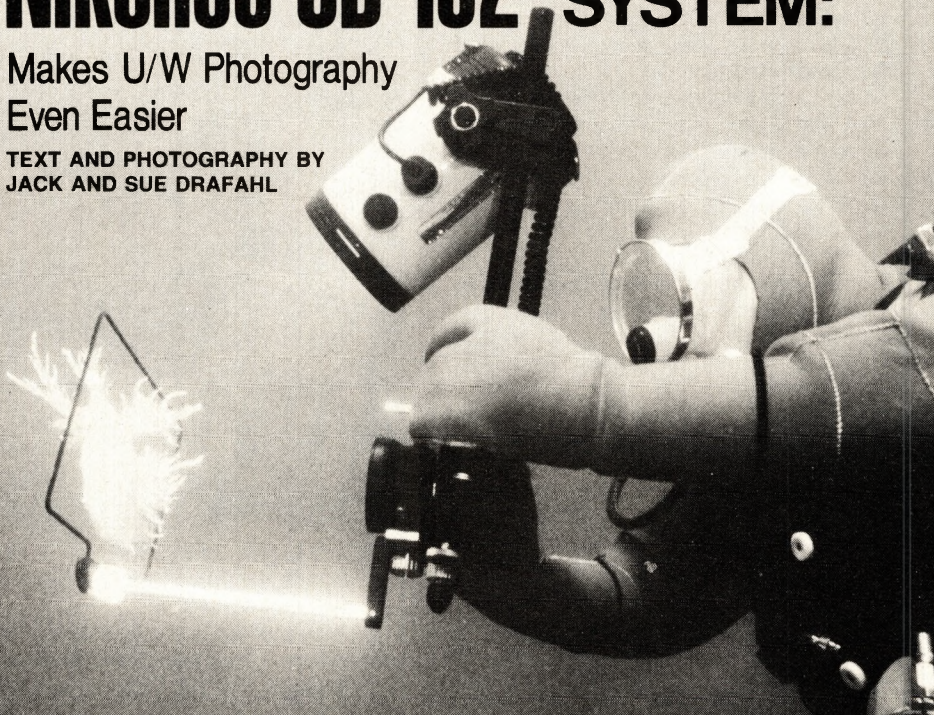
To understand just how the strobe works one only has to look at the control panel. The first of three switches turns on the power and allows the strobe to be test fired to ensure it is working properly. Between this switch and the second is the



Nikonos SB-102 STROBE SYSTEM:

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The SB-102 strobe offers Through-The-Lens (TTL) flash metering when used with the Nikonos V camera. The strobe can be used on manual with the Nikonos III, IV-A or V, as well as on automatic (utilizing the SU-101 sensor) with the III and IV-A.

ready light. After the power has been turned on for a few seconds the ready light will glow red. This means you have at least 80 percent power and can take a picture using the auto or TTL settings. When you hear the strobe turn off you will have 100 percent power and can take pictures using the manual settings. If the ready light blinks just after taking a picture, it may be indicating an underexposure. Therefore, you may want to bracket by opening the aperture one stop or moving closer to your subject.

The second switch has three settings. The first turns on a target light. Light from this is projected through a lens system and out through the center of the flash-tube. It helps line up the strobe so it is centered on the subject. On several night dives we found our flashlight could be turned off and the target light used to align, focus and photograph fish and various other animals with great success.

This second switch also has a slave mode, allowing others to photograph the SB-102 and trigger it. The slave mode can be used with another strobe with the Nikonos III, IV-A or V camera systems. The third setting of the switch allows the use of the target light and slave mode to-

gether, to aim the slave accurately.

The third switch offers underwater photographers the most control of all: It allows you to decide the amount of power to be used. The first setting is called the TTL position and is designed for use with the Nikonos V only. When the switch is in this position, exposures are calculated through the camera lens. As the light strikes the subject it reflects off and through the lens and onto the film plane. From there it reflects onto a special sensor within the camera. The camera monitors the amount of light and turns the flash off when the exposure is correct. Any leftover charge in the battery is saved for the next exposure.

The SB-102 has three manual settings: M Full, M 1/4 and M 1/16. (M 1/4 power produces a guide number one-half that of full power; M 1/16 produces a guide number one-quarter that of full power.) Manual control can be very useful when the correct exposure cannot be obtained through non-TTL automatic operation. To obtain correct exposures using the manual mode, set the film ASA on the exposure calculation dial on the back of the strobe head and select the correct aperture for camera-to-subject distance. Set

this aperture on the camera lens. Keep in mind that the full power setting uses a lot of power and tends to drain the batteries.

We found the M 1/16 power setting to be very useful when taking photos of the SB-102 as a prop using the slave mode. It seemed to give a correct exposure showing the SB-102 at work.

The final setting of the third switch is auto, for the Nikonos III or IV-A cameras. To use this position you must first attach the SU-101 unit to its port on the base of the strobe or in the accessory shoe on top of the camera. Auto settings are found on the exposure dial on the back. Once you set the aperture on the camera and the color code on the sensor according to your calculation from the exposure dial, you have an auto exposure Nikonos.

Be aware that in any situation where the Nikonos III or IV-A was mentioned, a Nikonos V can also be used. We assumed that if you had a Nikonos V camera, you would prefer the SB-102's sophisticated TTL system specifically designed for use with it.

After extensive testing of the SB-102 system we found two areas in the instruction manual needing clarification—battery performance and effective use of TTL.

We tried just about every battery possible with the SB-102 and have narrowed them down to four basic groups: (1) carbon zinc, (2) alkaline, (3) ni-cad, (4) industrial ni-cad.

The first is usually called a general use battery and does not work with the 102. Alkaline batteries work well and begin with a ten second recycle time at full manual power. Using TTL or auto exposure, the starting recycle time drops to one to five seconds. With alkaline batteries, 150 exposures at full manual power and more than 700 at TTL and auto can be made.

Ni-cads worked about the same as the alkaline batteries, the only difference was the lasting power. Ni-cads lasted about one-quarter as long as the alkalines. Ni-cads can make 100 exposures at full power and more than 500 using the TTL and auto settings. The advantage of the ni-cads is that they can be recharged over and over.

By far the best batteries for use with the SB-102 system are called industrial grade ni-cads. Ni-cads come in two groups—consumer grade, with a rating of 1.2 volts at 1.2 amp/hr; and industrial grade, with a rating of 1.2 volts at 1.8 amp/hr. When using industrial grade ni-cads recycle time doesn't exceed four seconds for the first roll of 36 exposures or five seconds on the second and the third rolls at full manual power. When using the TTL or auto settings with these batteries recycle times for close-ups are less than one second and wide angle

(Continued on Page 138)



A complete Nikonos system might include both the SB-102 and SB-103, the latter for use when a smaller, less powerful strobe is desired. In addition to TTL and auto, the SB-102 offers three manual settings—full, 1/4 and 1/16. It has a target light and can operate as a slave. Left: The SB-102 is powered by six C-cells. Either alkalines or rechargeable ni-cads can be used.

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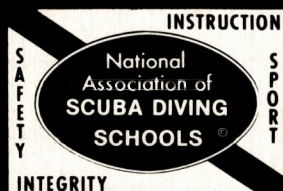
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DRILLING MUD

(Continued from Page 131)

Morse's study and said he felt it "ought to be looked at." He suspected the amounts of mud Morse used in his laboratory experiments were too high. "Laboratory conditions have to approximate what happens in the ocean," Steel said.

Morse responded by pointing out that his studies at the university revealed toxic effects of drilling mud constituents at concentrations 10,000 times lower than previously detected in "old-fashioned" studies that ignored the very sensitive larvae.

Steel said OTAP is planning to set up a study based on what Morse has done, but that in the meantime, drilling mud will be dumped into the ocean—apparently



Discharged drill mud billows out into open water from a drilling operation. Is the mud toxic enough and concentrated enough to destroy marine life on a large scale?

with OTAP monitoring the biological developments. "If we had it our way, we'd put off drilling operations until we knew if it would harm things," Steel said. "But we'd be overruled and then we'd have no say at all." Scientific testing is not the "real world of oil company operations," he said.

The lament over lack of data about the biological conditions of the area before oil drilling operations may be a curious one—since some available data apparently exist in the university system. And, one scientist said his findings were turned down by OTAP.

Dr. Adrian Wenner, a professor of natural history at UCSB and Morse's colleague at the Marine Science Institute, has been studying, since 1967, the possibility of using sand crabs as monitors of ocean pollution. Sand crabs, Wenner said, are significant because they are at the base of the food chain and feed on plankton from surrounding waters. If sand crabs are disturbed by pollutants, they may fail to produce eggs, their growth rate is reduced and they may fail to survive the winter. They also take in pollu-

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tants in significant concentrations that remain in their bodies.

Wenner's crab studies accelerated in 1982 with increased industrial activity in the channel and have been done on the beaches of Jalama, Pismo, Avila, Morro Bay, Goleta, Santa Rosa Island and Santa Cruz Island. His findings have been offered to OTAP, the California Fish and Game Department, the Environmental Protection Agency (EPA) and other agencies, but were turned down.

The reason he was given was that the beaches from which he collected the crabs were "too far away from the oil platforms," Wenner said.

Wenner's crab studies, however, have been effective in localizing some adverse environmental effects near the San Onofre Nuclear Generating Station (SONGS) on surrounding sea life up to ten miles from the station. Wenner also detected toxic substances in sand crabs from Santa Monica Bay, 20 months before the alarm was sounded against eating fish from that area.

Other crab studies revealed that a copper compound had been dumped in an Oceanside harbor, a situation that later led to citations for harbor officials.

Wenner feels that any adverse effect from increased oil production activities in the channel will first become apparent by a study of animals such as sand crabs, for which baseline data are available.

One oil company official admitted that before and after specifics would help a drilling mud study recently done for his company, but that without such specifics, the objectivity of the study is "as good as we'll ever get."

Dan Vossler, district environmental coordinator for Unocal's western region, also said that the study (done by Kinnetic Laboratories, Inc. under the auspices of OTAP), failed to distinguish between the effects of drilling mud on hard bottoms (reefs) and soft bottoms (sand). The study also makes no conclusions on recolonization of marine animals that have been smothered or killed in some other fashion by mud, he said.

The Kinnetic report, published in November 1984, in preparation for Unocal's plan to drill in the channel, "can be taken from either side of the fence," Vossler said. "It depends on how you look at it—especially before you see it," he explained. "They (Kinnetics) don't want to do anything so caustic we'll never use them again, but they tried to keep an objective balance in their findings."

Vossler admitted that more studies need to be done on the subject of drilling mud, but that his company is not involved in any more studies at this time. "Consider that generic drilling mud is imported clay—soil—and compare that with the volume of runoff in the natural hydrological cycle," Vossler said. "It's like a needle in a haystack—extremely difficult to find a universal deleterious effect—that's my opinion."

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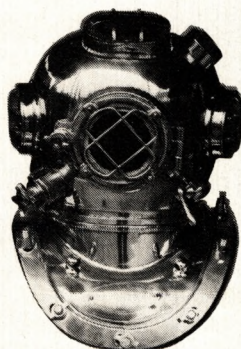


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At a special reception during DEMA in Orlando, the Dacor Corp. premiered a new film produced for them by Stan Waterman entitled *Scuba*. The half hour feature presents a history of diving that is both humorous and factual. That is followed by a look at the state of the art in equipment manufacture and concludes with the joy of diving, a montage of highlights from Waterman films. The film was produced to be entertaining, inspiring and informative, for use by Dacor distributors throughout the world. Video cassettes of *Scuba* may be ordered through Dacor dealers.

RAINBOWED SEA HONORS

Within a *Rainbowed Sea*, by SDM contributor, Christopher Newbert, has garnered an impressive number of honors and awards, more than any other book of underwater photography. These include: gold medals for best book design and best photography of 1985 at the 64th an-



photo/Bonnie J. Cardone

nual New York Art Directors' Show and most outstanding book of 1985 from the Printing Industries of America. In addition, the book was selected by the International Center of Photography as its Tenth Anniversary Gift Book and has been featured in both the Communication Arts Photography Annual 1985 and the Communication Arts Design Annual 1985. Almost 30,000 copies of the book, published in the fall of 1984, have been sold.

Newbert specializes in marine life portraits. His first published magazine picture—of a sailfin leafish—was a SKIN DIVER Fish of the Month in June 1978. Since then, he has contributed 13 additional Fish of the Months. His second FOM—a spectacular Tinker's butterfly—graces the cover of SKIN DIVER's *Book of Fishes*.

LIGHTWEIGHT CHAMBER

C & C Engineering of Turin, Italy has recently started production of the UTIL 500 Lightweight Hyperbaric Transport Chamber. This is a totally new concept in one man chambers for use in association with both commercial and sport diving as well as for many other hyperbaric oxygen therapy applications.

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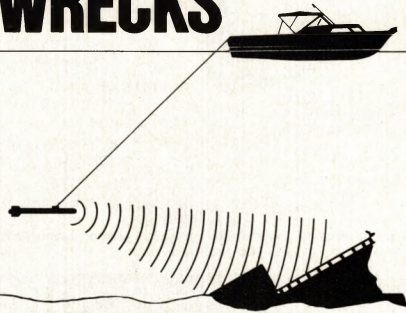
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NC DIVE RESCUE COURSE

The Jackson County Rescue Squad Underwater Emergency Response Team, in conjunction with Dive Rescue, Inc., International, will sponsor a dive rescue class at Western Carolina University in Cullowhee, NC, April 18-20. The class will include problem solving, use of specialized equipment and techniques and will prepare participants to rescue divers and non-divers.

Because of the nature of the course, advanced open water divers are preferred but open water divers will be allowed to participate under certain conditions. Continuing education credit will be offered for NC basic life support and advanced life support to all emergency medical technicians.

For information contact Reg E. Moody, Jr., Jackson County Rescue Squad Underwater Emergency Response Team, P.O. Box 158, Sylva, NC 28779; (704) 586-6192 or 586-4014.

GLASS EELS

Dr. Gordon Williamson of Scotland is asking for information on glass eels. While these transparent, six centimeter long young of the freshwater eel are known to drift in the Gulf Stream, several have been seen drifting in a vertical orientation. Do all glass eels float vertically? To help answer this question, divers along the U.S. East Coast are asked to watch for these animals in the spring.

For later identification, the animals can be preserved in alcohol. Information should be forwarded to Dr. Gordon R. Williamson, Heather Cottage, Kessock, Inverness, Scotland.

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Charles S. Jehle has been appointed national sales manager for Aquacraft II. He will be overseeing all U.S. dealer sales as well as spearheading Aquacraft II's recent appointment as U.S. distributor for all Technisub products.

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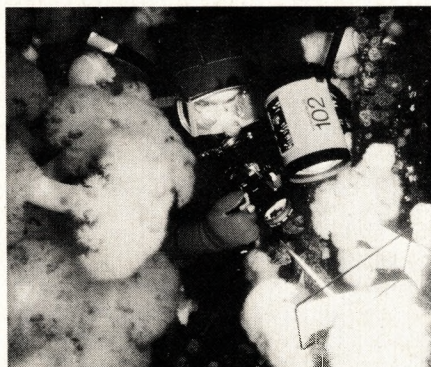
SB-102

(Continued from Page 133)

photos may take approximately 2.5 seconds. These ni-cads provide about 100 exposures at full power and more than 500 using the TTL or auto settings. These batteries are also rechargeable.

All these batteries can be purchased from most any store that sells batteries, with the exception of industrial grade ni-cads; they must be special ordered from an electronics store. There are several chargers available from Radio Shack, General Electric and Eveready for recharging either type. The Eveready charges six C-cells (needed for the SB-102) and seems to be excellent.

We recommend that the serious underwater photographer buy two sets of ni-



cads and one set of alkalines. Put one set of charged ni-cads in the SB-102 strobe for a day of diving and leave the other set in the charger for the next day's dive. Take along the alkaline batteries for use if the ni-cads should die an early death or if several rolls of film are to be exposed in one day.

Through-The-Lens systems can only be as good as the photographer's understanding of just how they work. A TTL system is always seeking an 18 percent gray exposure. If you were shooting close-ups and the frame were full of subject matter, the TTL would work perfect—36 out of 36. But if you were to use a wide angle lens, where a small portion of the picture contains subject matter and the rest is black background, the TTL would tend to overexpose. This happens because the camera sees all the black area and tries to provide enough exposure to make it 18 percent gray. Don't worry though, the cure is simple. If you have a sizeable dark area in your frame you can correct the TTL system by doubling the ASA on your camera. Just don't forget to reset the ASA when the subject fills the frame again. This is not a defect in the SB-102—it is common to all TTL strobe systems.

Flash fill with the SB-102 is simple and allows you to create those hard-to-take photos everyone loves—you know the ones—the diver swimming down, with the sun above, yet the reef is well-exposed

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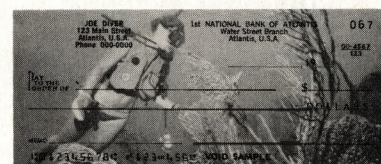
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near the diver. Simply set the Nikonos V to auto and the SB-102 to TTL. Look through the viewfinder while turning the aperture until the shutter speed is near or below 1/125. This indicates the sunlight exposure is near flash synch. When you expose the picture the TTL system correctly exposes the foreground, and since the TTL flash synch is at 1/90, the background is also correctly exposed.

The SB-102 has an U/W guide number, at full power with ASA 100, of 53 feet. It comes complete with everything you need to create great photos (except the Nikonos V) but accessories to increase the SB-102's versatility include: the Sensor Unit 101, sensor holder, double strobe bracket, double synch cord and extension arm.

The suggested list price for the SB-102 system, including brackets, synch cords and carrying case, is \$910. It can be purchased from your local Nikonos dealer. The Nikonos SB-102 system: Treat it with TLC and it will provide you with high quality TTL. 

DIVING MEDICINE

(Continued from Page 38)

Question: Every time I wear my new wetsuit, I break out in a rash. Is it possible to be allergic to a wetsuit?

Answer: Your response to wearing the wetsuit can be either an allergy or a direct effect of some chemical in the suit that causes injury to your skin. You might try soaking the suit in soapy water overnight to remove any chemicals that might cause allergy or skin reactions, then soak it in fresh water for a few hours before trying to wear it. If you still get the reaction, it is likely you are sensitive to some component of the suit.

Question: I have a tendency to get infections in my external ear canal when I dive. Is there a remedy for this?

Answer: Swimmer's ear is a significant problem in many diving operations. In saturation diving, this was a real problem, causing loss of diver effectiveness. The use of a dry helmet will not guarantee the illness will disappear. The air in the helmet is moist and it is the moisture that causes the infection.

The best way to avoid this problem is by using prophylactic measures. Using ear drops before you dive will prevent water from accumulating and will provide some oil to coat the ear canal. The best solution I have seen is a mixture of alcohol, white vinegar and a light organic oil called Otic Domeboro. Two drops of this in each ear before diving will usually prevent the infection.

Most ENT physicians I know who dive say cotton swabs used in the ear canal will remove the important oily layer and make you more prone to swimmer's ear. 



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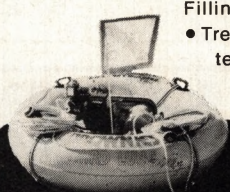
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BY E.R. CROSS

Throughout the evolution of diving, from the very early origins of primitive breath-holding to the present high-tech bell and saturation diving, the basic reasons for going underwater have changed little. Men and women, as underwater hunters or deepsea workers, spend minutes, hours or even days submerged in a quest for food or to accomplish specific tasks. The things that have changed are the techniques and equipment and, equally as important, the methods of training divers. It is the proficiency in training men and women to work at any depth, at any job, that has made the College of Oceaneering a leader in the complexities of modern diver education.

The College of Oceaneering was originally founded in 1969 as the Commercial Diving Center, for the purpose of training entry-level commercial divers for the offshore oil industry. Then, as now, the school was at 272 South Fries Avenue, Wilmington, CA 90744. To meet the changing demands of the offshore industry the school has continued to expand, adding courses, updating its curriculum and employing instructors qualified in the more complex work being demanded to keep the aging offshore structures safe and functioning.

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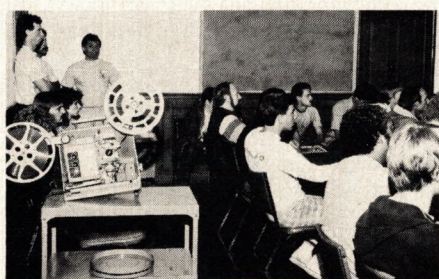


photos/courtesy College of Oceaneering

College of Oceaneering in Wilmington, CA.

ble for the school to offer an associate of science degree in applied science. The College of Oceaneering is also the official and exclusive diver training center for Oceaneering International, one of the world's busiest offshore oil service companies, employing hundreds of commercial divers throughout the world.

What kinds of jobs are divers employed to accomplish in connection with the offshore industry? Just about anything that can happen will happen to ships, drill rigs, production platforms, underwater pipelines, tanker loading systems or to instrument packages. When it does happen divers are used to inspect, repair, recover or replace the damaged or missing objects. Sport divers considering a career in commercial diving should remember, regardless of the location of the underwater job, diving is only the means for a skilled craftsman to reach the worksite. Once there, it is what the diver can do that determines his/her value to an employer.



Training films are part of CO curriculum.

Diving today is highly technical and continues to change rapidly. Those who want to participate in high-tech diving and be able to operate the most advanced diving equipment must keep up with the industry's advances. Also, commercial oilfield divers must have skills in underwater welding and cutting, rigging, the use of hydraulic and pneumatic tools, the use of concrete underwater and be able to adapt all conventional topside hand tools for use on diving jobs. It is in providing training and experience in these skills that the College of Oceaneering plays

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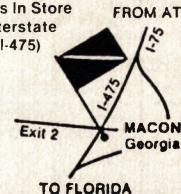
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COLLEGE

such an important part in helping students achieve successful diving careers.

Twenty-one year old Mike Hedke, from International Falls, Minnesota, asked what courses at CO were most helpful to him, stated, "I want to work as a salvage and construction diver. My training as an air diver and skills developed in underwater welding and burning and in demolition will help me achieve my job objective." He added, "The instructors at the college play a great part in the success of training and acquiring diving skills."

Perhaps in no other kind of trade school are the qualifications of the administrators and instructors as important as they are in a diving school. Not only



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must the instructors teach students to accomplish difficult tasks while using sophisticated diving equipment, but they must also instill in those students the right attitude about working in a potentially hazardous environment. They must help develop a tendency for persistence in job accomplishment but avoid an inclination for stubbornness, which could lead the student into danger.

Jim Joiner, president and executive director of the college, is responsible for designing, implementing and supervising administrative policies, as well as research in and development of training programs. During a long question and answer session, he told me, "My primary goal is to develop a training program that will provide qualified entry level divers to the offshore oil industry. Constant upgrading of our courses helps the college meet this goal." Later he commented, "Recruitment of job experienced instructors is also an important part of maintaining course effectiveness."

When Nigel Thomas, 19, from Balfour, B.C., Canada, was asked why he wanted to be a commercial diver, he replied, "I was a certified NAUI diver when I was 15. I've always wanted to be an oilfield, construction and salvage diver." When asked about the instructors, he added, "Not only do they teach here, but they counsel well too."

All applicants for training at the College of Oceaneering must provide proof of scuba certification prior to the first day of training. Such proof may be a C-card from any of the recognized certification agencies. Entrance tests are also given prior to acceptance. Pre-enrollment tests include mechanical aptitude, tests in basic math (addition through ratio) and a knowledge of basic safety. Applicants must have the equivalent of a high school education and must pass a strict CO approved medical exam. The handbook states, "Because of our record of tough entrance requirements and our training excellence, diving contractors know they can hire CO graduates with confidence."

In the college newsletter Monthly Report, Editor Judene McBrien reported, "Cory Reeks, Terry Dodd and Scott McLuckie, all of Class D-168, are together at SeaCon in Louisiana along with Bill Greening of PD-159. The divers reported, 'It's a nice feeling to apply what we've learned in a class so soon to a steady job.' Terry and Scott were interviewed together and got work only three days after arriving in Louisville."

Each course taught at the college has, within the basic objective, many skill requirements. As managing director of operations, Tom Mix is in charge of all operational and training aspects of the school. His personal skills include underwater metal burning, oilfield diving operations,

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demolition and videotaping projects. He served as the supervisor for the Underwater Photo-TV Course and has been with the school, on his present assign-

ment, since 1983. Tom explained how he feels about the greatly diverse qualifications required to be a successful diver. "The range of underwater tasks the diver may be called on to perform is very wide; rarely are two jobs exactly alike. Tools and equipment are also disparate from topside norm."

One student who will probably thank Mix for his expertise is Jim Doherty, 24, from Hermosa Beach, California. When questioned about his interests in the various fields of diving Doherty said, "I want to start in oilfield diving and construction but in the long run I would like to get into studio work, like underwater screen sets, photography and filming." He added, "The instructors give out a lot of information to help us in the real world of diving."

Carl V. Skinner, West Covina, California, will be glad he had Ray McNew as an instructor. "I want to get into construction, inspection and mixed gas diving," he told me. "The instructors help me keep a positive attitude in my training and in preparing me to begin work in the field of diving." McNew is the CO mixed gas diving instructor. He also teaches diving physics, physiology and dive medicine. He was a 20 year Navy hospital corpsman, diver and medical deepsea diving technician. He brings a special degree of professionalism to the College of Oceaneering staff; a professionalism that will be imparted to students.

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COLLEGE

Originally, there were three phases in the development of an offshore oilfield: the initial exploration; construction of drill sites and the drilling; and finally the installation of production platforms and recovery of the oil. Divers were used in all these phases of oilpatch work. In recent years additional spheres of diver employment came into existence. These special projects, all of which frequently require diver help, are underwater pipe laying, maintenance work on all types of structures and inspection and instrumentation work of several kinds.

Not always will working in the offshore oil industry be exactly what some aspiring divers have dreamed it would be. A manual sent to prospective CO students pointedly states, "Commercial diving offers a life filled with adventure—provided you are willing to do manual labor in an environment that is cold, dirty and hostile to the human body. Being a commercial diver is out of the ordinary. But you do very special work and that is a good feeling." Another statement from the same brochure added, "Commercial diving requires travel."

The consensus of most commercial divers is that diving for high pay is not a part time job; it is, however, a migratory job. To keep employed full time a diver simply must follow the jobs as they develop, wherever they are.

Probably this nomadic, exciting life is an attraction to many divers. Tim Evers, Orange, California, told me, "I was bored with life and wanted some risk. And, I like to travel." Dan Brown, Mundelein, Illinois, stated, "Diving is exciting; challenging. And, it is a field that is going in many directions." Another interview, this one with Ivan Nelson, Garden Grove, California, elicited similar information. "I want to be a diver because diving has travel opportunities and good pay." Smiling, he added, "Besides, I've wanted to do this since I was 16 years old."

Underwater pipe laying usually involves diving work, whether the pipes are laid from barges or from more conventional work platforms. Such diving work is usually limited to inspections of the pipelines as they are being placed and during backfilling. The exception is the work a diver may have to perform as part of jetting a pipe into the ocean floor from a jet barge. Seldom is a diver used in underwater welding during pipe laying operations. Some, but not all, weld repairs to submerged steel pipes are done in a dry environment in a hyperbaric chamber. Since the system involves working under pressure, even though in a dry environment, divers who are certified welders are usually used.

College of Oceaneering student J.P. Balloway of San Jacinto, California, had

this in mind when he stated, "Since I've always liked scuba diving and welding I now want to specialize in underwater welding . . ."

Special courses in skills required for underwater inspection and non-destructive testing are helping to prepare students for these rapidly expanding fields. Some offshore structures in oilpatches around the world have been in service for more than 20 years. To keep them operationally safe and in production requires constant inspection and servicing. Divers qualified in these fields should enjoy a busy and rewarding career.

Ray Vinson, Muleshoe, Texas, said in an interview, "I want to get into highly specialized NDT (non-destructive testing) and Level II ultrasonic work. The instructors are playing an important part in my reaching these high-tech goals."



A CO student checks his diving helmet.

The College of Oceaneering recognized the advantages and the trend in the use of remotely operated vehicles (ROVs) and developed Course 256, Underwater Inspection for ROV Personnel. The information brochure on this course states, "During the last few years, ROVs have played an increasingly major role as a primary work tool for offshore structural and pipeline inspections." In practice it was soon found that divers using the ROVs made better operators than non-divers. Basically this is because divers are already familiar with the underwater environment and are more aware of what the ROV will encounter during its underwater inspection deployment.

Some of the work a commercial oilfield diver encounters will be very similar to topside work. Flanges will need to be bolted up using the same wrenches as in above water work. Pipes will need to be fitted together. Chains and slings will have to be attached for lifts made by topside equipment. Lift bags will sometimes have to be rigged for moving heavy objects underwater. Power tools, both com-

(Continued on Page 148)

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Sherwood Package
Pro-Plus B.C.D. with waist support band, power inflator, rapid exhaust, and soft band pack, balanced Magnum regulator with octopus, pressure gauge, and aluminum 80 cylinder with K valve. This package is also available with the Freedom B.C.D. for an additional \$35.00. Retail over \$1064.00
In store sale price \$579.95



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Diving News

From Down Under

Heron Island's Popularity Grows

TEXT AND PHOTOGRAPHY BY GERI MURPHY

Heron Island, Australia's oldest and best known dive resort, is still its most popular vacation spot. An estimated 2,000 divers visit this tiny Barrier Reef paradise each year, with more than 50 percent coming from the U.S.

Heron is a tiny speck of an island at the southern end of the Great Barrier Reef, 50 miles off the Australian coast. It can be reached by either high speed launch or helicopter from the Queensland seaport city of Gladstone. The island sits in the center of 50 square miles of Great Barrier Reef that have been declared a Marine National Park. All living corals, fish, turtles and birds are protected by law. The primary rule at this small resort is to enjoy nature without disturbing it.

Heron is a flat coral island completely encircled by a pure white sand beach. It is only one-third of a mile long and 330 yards wide. Guests can walk the entire island in a half hour. Heron Island resort is a comfortable no frills facility with the accent on nature and outdoor activities. There are no cars, motorcycles or trucks. Tractors are used for hauling boats, scuba gear and luggage. Guests walk everywhere, using footpaths and narrow dirt roads. Rooms are cooled by ceiling fans and windows are screened.

Because Heron Island is a wildlife sanctuary, the resort has become a nature photographer's supermarket. You can shoot more nature photos per hour than any other place on earth. The island is home for an estimated 139,000 seabirds (35 species) that come and go at various times of the year. These birds can be found nesting in the trees surrounding the resort, sitting on the roofs and walking the pathways. They have become accustomed to the hotel guests and can be photographed at close range.

The most prominent species on Heron is the white-capped noddy tern. An estimated 90,000 of these web footed, sooty-black birds live on the island year-round. They can be observed building nests, hatching their eggs and feeding their chicks. An estimated 17,000 muttonbirds are seasonal visitors who build their nests by burrowing in the ground. They have a strange courtship that occurs at night and consists of eerie cries.



Heron is a tiny island in the center of 50 square miles of Great Barrier Reef that have been declared a Marine National Park. Dive boats depart twice daily for visits to a variety of sites on the inner edge of the GBR. Left: Heron Island helipad.

supports the richest and most diverse collection of tame tropical fish found anywhere in the world."

Heron operates a complete dive center on the hotel premises with two regularly scheduled dive boats and one high speed shark cat for charter trips. The resort schedules one tank dive trips twice daily at 9:15 am and 2:15 pm. The dive boats visit approximately 16 different dive sites in depths from 30 to 70 feet. Because Heron lies on the inner edge of the Great Barrier Reef, underwater visibility runs from 20 to 70 feet, depending on the tides and wind.

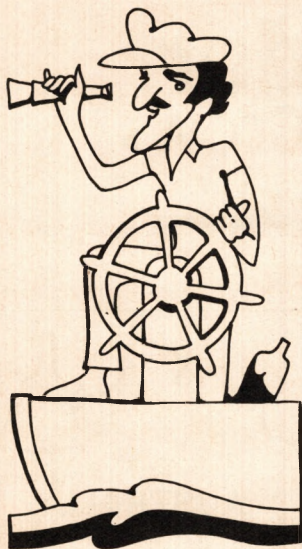
The world famous Big Bommie is a dive site well known for its tame fish. Here guests mingle with batfish, barramundi, sweetlips, coral trout and dozens more. Dive guides point out wobbegong sharks and hand-feed giant moray eels. At other sites like Blue Pools, the coral reef rises up to within a few inches of the surface and the shallows are filled with *Tridacna* clams, soft corals, nudibranchs, Christmas tree worms, starfish and a myriad of colorful creatures.

For more information and reservations at Heron Island contact any of the major U.S. dive travel agencies such as Poseidon Ventures, Sea Safaris, See & Sea Travel, Tropical Adventures, or write: Dive In Australia, 680 Beach Street, Suite 340, San Francisco, CA 94109; telephone (415) 928-4480. 

Still another phenomenon of nature that takes place on Heron is the perennial turtle nesting from November through March. An estimated 100,000 eggs are buried on the beaches of this island by approximately 900 green and loggerhead turtles. Each night, the expectant mother turtles slowly crawl up the beach, dig holes in the warm sand with their rear flippers and deposit some 100 eggs per laying. The baby turtles hatch from their eggs 8 to 12 weeks later and scurry down the beach into the sea. Guests have an opportunity to observe this nightly ritual while park rangers explain the entire process.

Heron Island's most outstanding attractions are the remarkable living coral formations that surround the island and amazing fish that inhabit them. The color and intricate forms of both hard and soft corals are simply breathtaking and there are over 870 species of fish in the area. Valerie Taylor has noted, "Heron Island

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COLLEGE

(Continued from Page 145)

pressed air and hydraulic, will be used on some. Rigging skills, such as block and tackle operation, the use of ropes and wire cables, knots and their uses, and salvage operations and systems are part of the basic diving course (Course 110) an intensive 10 week program with a 30 unit credit toward an associate in applied science degree.

All courses offered by the College of Oceaneering are degree credit courses, the total number of units of credit granted depending on the course length and, in some cases, other considerations.

Susie Ungaro, job placement coordinator, is an important staff member at the college. At a computer terminal in her office and flanked by telephones, she keeps requests for divers and tenders from more than 300 diving contractors matched to graduates. "The major quality contractors want in a diver is versatility; a diver who can do anything," she said. "And, it's my job to find those students and graduates who can do anything and can go anywhere at any time." The school is extremely proud of the job placement services provided its graduates. In her work in job placement Ungaro has developed good rapport with the various operations managers of marine construction and offshore oil companies. She takes pride in her job and in the trust prospective employers of CO graduates have in her ability to refer the right graduates to the right jobs.

Commercial diving, and particularly diving for the offshore oil industry, is possibly the most exacting of all the kinds of work a diver must do. But it offers well qualified professional underwater workers great diversity in their work, good security and many rewards for their efforts, including a life of adventure.

Jim Joiner admits commercial oilfield diving is not a profession for everyone. He told me, "The school receives hundreds of inquiries per month from prospective students. Of these we accept only 250 per year for training."

Today's divers must be proficient in many skills and be mentally prepared to face hostile environments and the exciting challenges that are part of the modern commercial diver's life. The prerequisites are demanding. Physical strength, mental toughness and the ability to adapt to working in an alien environment are important attributes in a student for success in this rewarding field. If a student has these attributes and is willing to work and study hard, the College of Oceaneering, a very sophisticated diving school, can provide the instruction and leadership needed to be successful.

DIVER'S DIRECTORY



Advertising rates: \$153.00 for three consecutive ads, \$264.00 for six consecutive ads, \$396.00 for a full year. DEADLINE: 28th of 3rd month prior to publication. PAYMENT MUST ACCOMPANY COPY. Send all material to: Diver's Directory, c/o Direct Marketing Division, P.O. Box 69910, Los Angeles, CA 90069.

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St. Louis. 70' visibility, 58° water temperature.	314/731-5003
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11004 Manchester Rd., St. Louis, MO 63122	314/822-3005
39 N. Allen, Bonne Terre, MO 63628	314/358-5000

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DOSIL'S SPORTS CENTER	201/787-0508
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3000psi air fills, indoor pool, repairs.	
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Spring Valley & Texas Rds., Morganville, NJ 07751	
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LAKELAND SCUBA DIVERS	201/887-0194
92 Route #10, E. Hanover, NJ 07936	
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pool, rentals, repairs, wreck dives weekly.	
MARLIN SCUBA SHOP	201/327-6000
506 Rt. 17, Ramsey, NJ 07446	
Full service PADI training facility.	
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PRINCETON AQUA SPORTS	609/924-4240
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UNDERWATER ADVENTURES	201/584-2789
1152 RT 10 Randolph, NJ 07869	
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PADI training facility.	
UNDERWATER SPORTS, INC.	201/843-3340
Rt. 17 S., Rochelle Park, NJ 07662	
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WHITEHOUSE AQUATIC CENTER	201/534-4090
Box 97-C, Hwy. #22 West, Whitehouse Station, NJ 08889	
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Private and Group Lessons, Dive Vacations, Wreck Dives.	

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PARAGON SPORTS	212/255-8036
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I Learned About Diving From That On Overconfidence And Big Waves

BY JIM WALKER

A lesson learned early in life is the most valuable kind. The problem is that youth has a habit of sneering at fate and getting away with it. Occasionally, however, fate deals a lesson that can't be overlooked, even by teenagers.

At age 14 I tasted my first abalone while in a restaurant in Ensenada, Mexico, and was hooked. I was on a beach camping trip with three friends of similar age (Rod, Chuck, Ted—the names have been changed to protect the previously innocent) and Chuck's parents. As the area we were camping in offered only small fish as game, I lobbied for a snorkeling excursion to La Bufadora (the blow hole), some miles south, where abs were said to be found. We were blissfully ignorant of the fact that only Mexicans can harvest abalone in Mexican waters.

The next day found the four of us standing on a cliff overlooking the bay adjacent to La Bufadora. The water was exceptionally clear.

The only problem, as we saw it, was that huge swells were rolling into the mouth of the bay and shooting directly down the length of it to explode on the beach—the only proper entry available. More mature divers would have aborted the dive right then, but we, confident in our immortality, thought we saw a way to beat the waves.

For a long time we deliberated what to do. We watched the waves breaking all along the cliffs. But, there was one spot just below us where the force of the waves was muted somewhat by an offshore pinnacle. It reduced the huge breakers to a peaking surge rising and falling four or five feet at the cliff bottom.

Totally confident in our abilities to negotiate such trifles, the four of us worked our way down the cliff face—carrying our fins, masks, crowbars and gunny sacks. Near the water's edge, we paused on a rocky projection several square feet in area. As we faced the water we noticed the waves surging below our feet funneled in to our left, circled under the cliff behind us and blasted out from under the cliff to our right. We realized anyone getting sucked through this horizontal blow hole would be ground meat by the time

they spewed out the far end. Maturity—even common sense—should have made an appearance at this point, but we possessed little of either.

After a few moments watching the waves we decided we could jump in the water from our rock, after one wave passed, and swim hard out 40 or so feet before the next came in. Then we'd be beyond the pull of the surge. Timing, of course, was critical. Two seconds either way and we'd be fish food.

With the luck of the young, our scheme worked! In a matter of moments the four of us were bobbing over the rollers just like we'd planned. However, we hadn't counted on the temperature. None of us had a wetsuit on and I'd estimate the water was about 58°F.

Hooting and puffing through our snorkels, we kicked out to several large, submerged rocks 100 yards or so offshore. And, we found abs! From the surface we could see one or two, four inch black abalone on each rock. To our eyes, these little fellows were a true prize.

For about 15 minutes we made dives for the abs—and even captured three or four. But, soon the cold numbed our bodies and forced us to head for the shore. We didn't realize our reactions had also been numbed.

Chuck and I watched a big boomer roll past our exit and then quickly kicked for the rock. Clutching our crowbars and abs, and still wearing our fins, we clawed our way quickly out on top of the rock, just ahead of a following wave. We set our gear high up on the cliff, well out of the way of the largest waves we'd seen.

We turned and offered encouragement to Rod and Ted, who also kicked in quickly between waves. However, when they arrived at the exit rock, Ted was ahead of Rod. In the brief seconds that separated their arrival, Ted managed to get mostly above the waves. But, Rod was lower, hanging onto the mussels and barnacles, when the biggest wave we had seen broke on the rock. Three of us scrambled higher and narrowly avoided being swept away as white water foamed and splattered all around us. Rod, however, was not so lucky.

He withstood the initial pressure of the wave, mostly by virtue of pure panic and

by being pushed against the barnacles. But, as the wave rolled off the side of our refuge, the roaring backwash pulled him until he clung by his fingertips, waving in the current like strap kelp. The pulling swell overcame his grip, and as the barnacles tore paths in his hands, dragged him away from the rock, toward the murderous funnel behind it.

Having lost one fin, Rod did the best he could to kick against the water as the rest of us, in our brilliance, yelled, "Swim, Rod, swim!"

For a moment it looked like he'd make it, as the force of the swell passed by him and boomed out the other end of the tunnel. But, just as his fingers contacted the barnacles again, another gigantic wave broke over our rock, again sending the rest of us up out of harm's way, and again pulling Rod toward destruction.

From much higher on the rock we still shouted encouragement, although we knew he was doomed, "Swim, Rod, swim! Swiiiiim!"

As Rod's one bare foot and one fin neared the mouth of the tunnel, he gave all he could in a last few kicks. Miraculously, he worked his way through the mountainous surge. This time, as his hands neared the barnacles, the rest of us grabbed his arms and pulled him up. As another wave (mercifully smaller than the last two) broke over our refuge, all four of us clung to each other and the rock. And, as the white water swirled away and around through the tunnel behind us, we climbed to safety. Rod was scratched up from head to toe, and his hands looked like hamburger, but we were all alive.

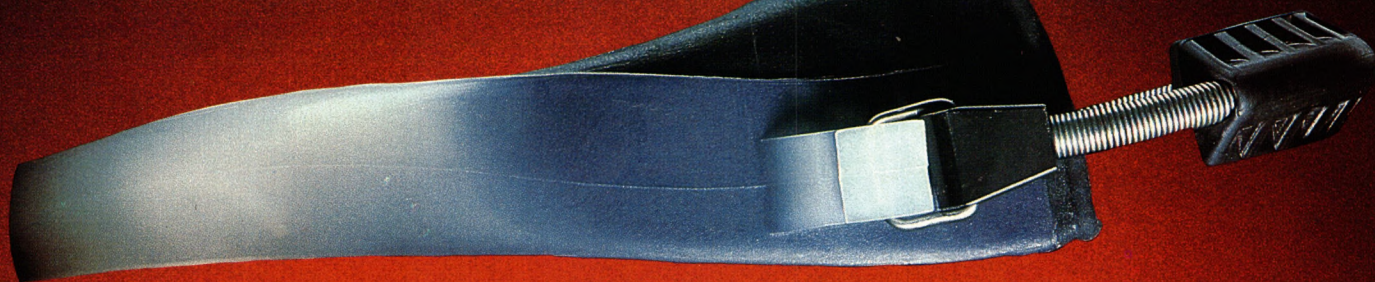
As we congratulated ourselves on making it through our brush with disaster, we turned and saw that the waves had, indeed, reached our gear, returning it and our abs to the sea. The only things that hadn't been washed away were our heavy crowbars.

Rod healed, and as far as I know, none of us was left with any deep emotional scars. But, we all learned two things: (1) Never knowingly place yourself in a situation where only your maximum ability will pull you through. There's no margin left for error. (2) The next wave can always be bigger. 

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